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AN ILLUSTRATED MONTHLY

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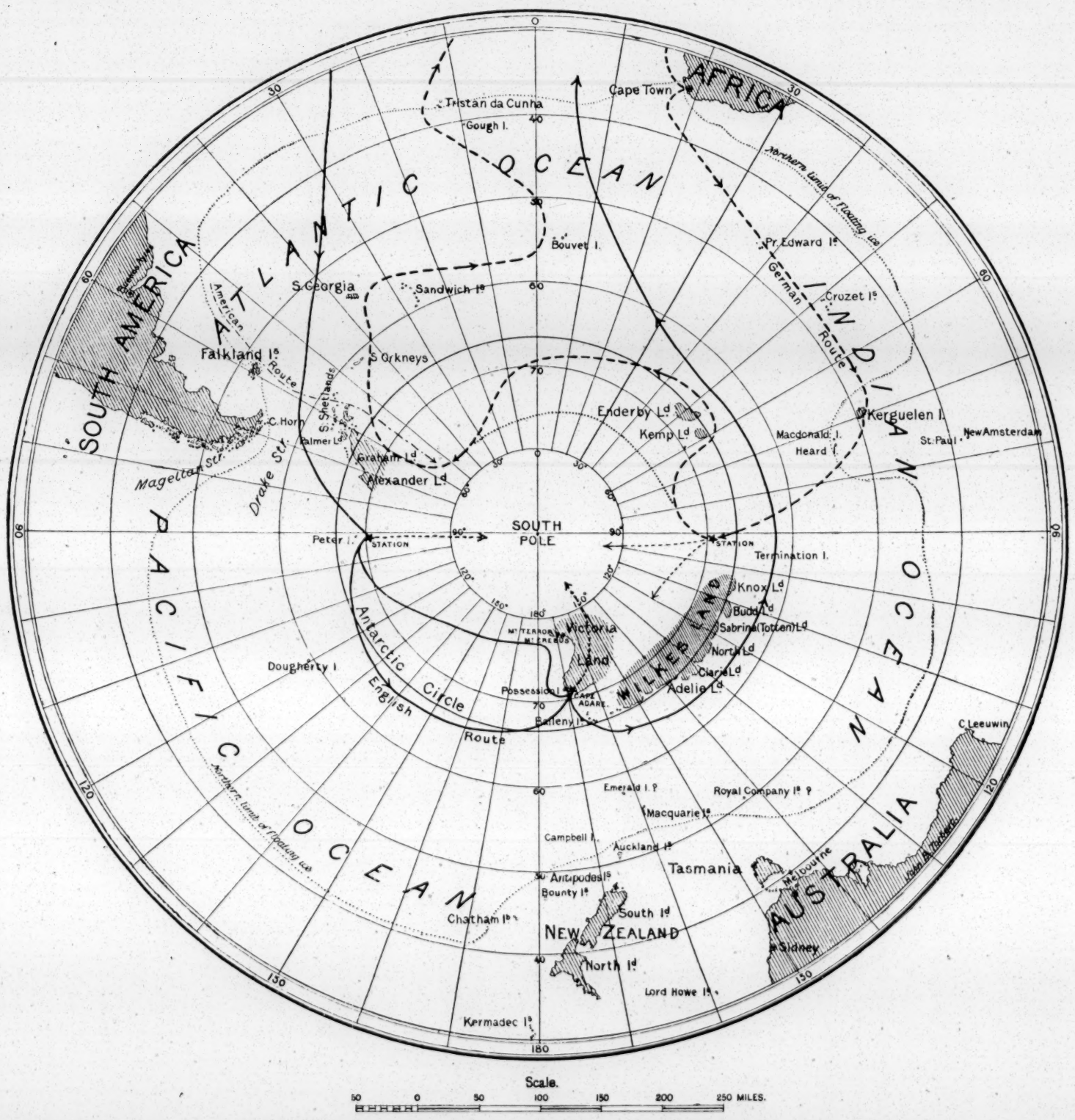


Scale.

50 0 50 100 150 200 250 MILES.

SOUTH POLAR REGIONS — SHOWING ROUTES OF THE PROPOSED ANTARCTIC EXPEDITIONS

THE
National Geographic Magazine

VOL. X AUGUST, 1899 No. 8

SHISHALDIN AS A FIELD FOR EXPLORATION

By JOSEPH STANLEY-BROWN

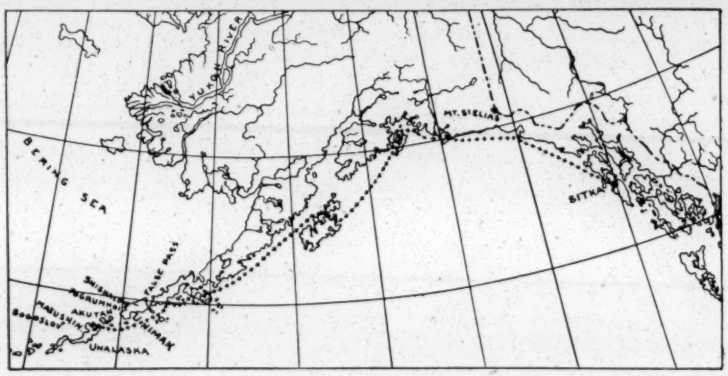
The areas within the boundaries of the United States yet untrod by the geologist or explorer are rapidly becoming fewer and fewer, while fields offering *unique* features of interest to either class of investigators are indeed rare. Even Alaska, formerly shunned, is now much in evidence, and is being traversed by private and governmental exploring parties to an extent which promises soon to gridiron that northern wilderness with mail routes and traveled trails, while from the systematic work being carried on by means of river, land, and sea we may expect at no distant day far more satisfactory geologic and topographic maps of the territory's vast and previously little known interior than have heretofore existed. Leaving these broader areas to those having special reasons and ample financial resources for surmounting the great obstacles they offer, attention is asked to a limited field of exploration which for compactness, accessibility, economy of effort and expense, and probable richness of returns stands unrivaled today within our borders.

The route from Sitka to Unalaska has been one of continuous travel by sea-going vessels for many years. While making this journey hundreds of voyagers have looked on and exclaimed over the majestic beauty of Mt Shishaldin, but so far as known no white man's foot has yet trod the higher slopes of this splendid cone, which rears its snow-clad crest nearly 9,000 feet above the adjacent sea.* The eastern half of Unimak island is occu-

*Professor Pinart's claim that he ascended Shishaldin is untenable, being evidently based on a misunderstanding of the name of the mountain he climbed. The ascent could not have been made in the limited time in which he states it was done.

pied by it and the associated peaks. This island, some 70 miles long, with an average width of 15 or 20 miles, crowded with extinct volcanoes and separated only by a shallow pass from the Alaskan peninsula, is the first member of the Aleutian archipelago—that chain of submerged mountains which with its prolongation, the Commander islands, sweeps from continent to continent, describing across the North Pacific ocean an arc of more than a thousand miles.

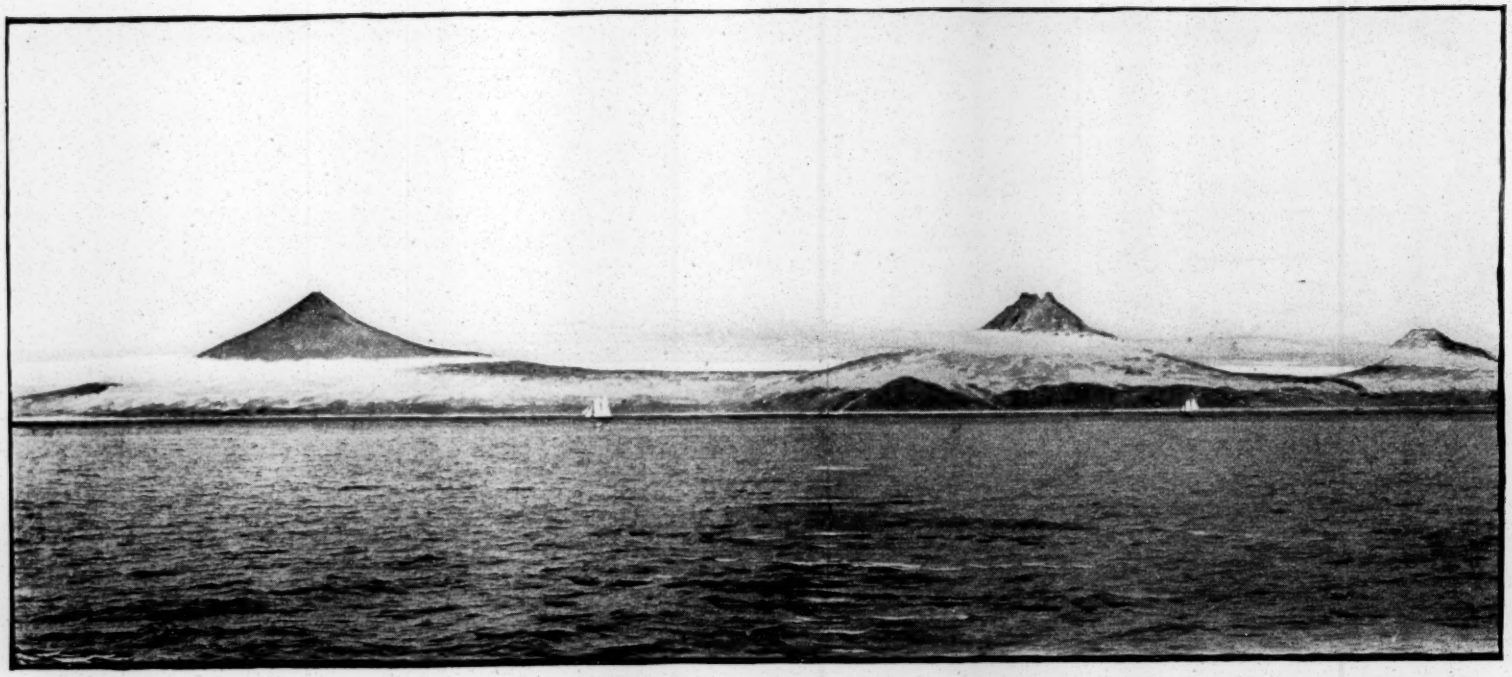
Shishaldin is undoubtedly still an active volcano, but how active cannot be accurately known until some explorer stands on its summit. There are recent stories by some who claim to have seen flame-colored vapors rising from it, and by others who assert they saw columns of smoke ascending. In 1897 I saw



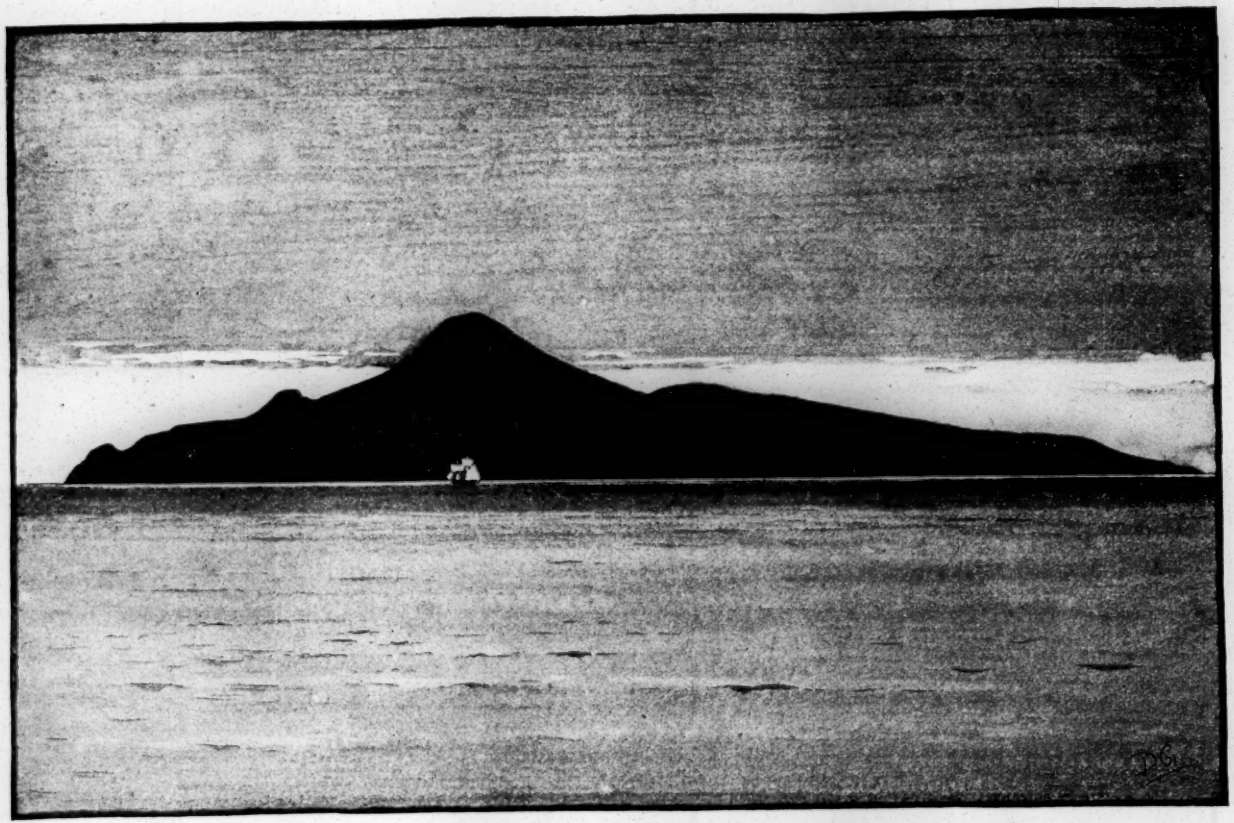
SKETCH MAP OF ALASKA

Showing mail route and suggested field for exploration

what appeared to be banners of steam issuing from it; but fogs are frequent here and snow carried by the winds about the peaks of mountains of high altitudes play deceitful pranks. There are two very intelligent and well-to-do traders (Charles Rosenberg and Charles Swanson) who live with their families at Morshovia village, near the base of the mountain. While on a trip in their schooner to Dutch Harbor, Unalaska bay, last summer for supplies they told me that the volcano is now in a state of eruption, and that at night they had seen, high on the slopes, tongues of molten lava creeping slowly down the mountain side and branching around obstacles lying in their course, thus leaving islands between the fiery streams. They asserted also that ashes are ejected from the crater, and that on hunting trips they had ascended far enough to detect the heat and recognize the sulphurous fumes.



SHISHALDIN AND ASSOCIATED PEAKS



AKUTAN ISLAND — ALEUTIAN ARCHIPELAGO

The determination of the real conditions is an inviting task. It will probably be found that Shishaldin is a gigantic cinder cone, one of the largest in the world, and of a symmetry equaling, if not surpassing, that of Fuji-yama. The accompanying reproduced photographs show not only the wonderful regularity and beauty of this cone, but also that it has a neighbor apparently its equal in magnitude and probably the true volcano as well as the elder of the two. The relationship may be similar to that existing between Lassen peak and the Black Butte cinder cone. As seen from a distance there appears to have been a lava discharge from the side of Shishaldin which cut a huge gash, while the castellated character of the adjacent peak suggests a well-formed crater with rock walls. The view of this most interesting mountain mass as given in the illustration must be interpreted with caution, for the apparent uniformity in the size of the two peaks may be due to varying distances from the camera. which was on the deck of a vessel at least 10 miles from the shore,

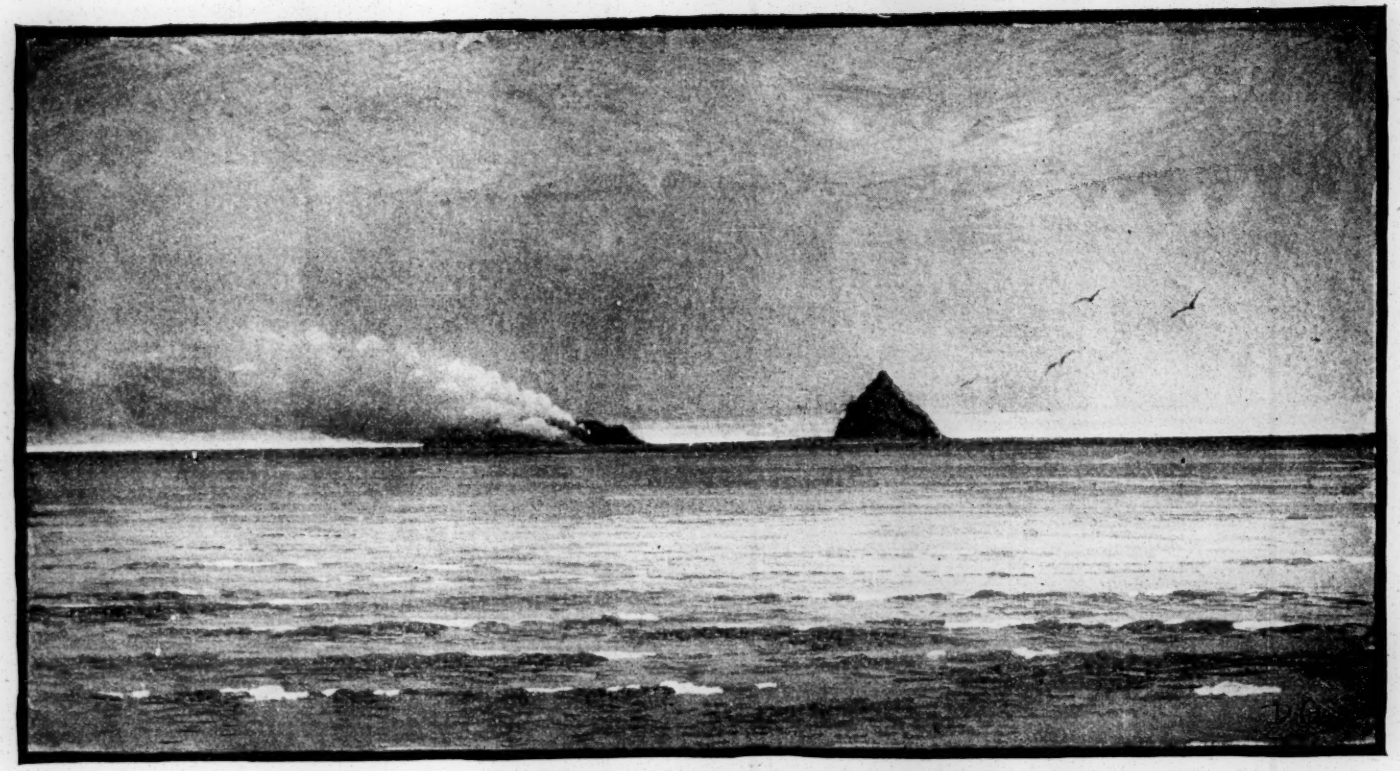
Unimak island alone, with the story of volcanism it has to tell, is well worth a summer's work, but near by within a circle of a hundred miles' radius there are other volcanoes with more or less residual life, which, with Shishaldin, form a group so favorably situated for exploration that its systematic study could be accomplished without great expense and in a short field season. Pogrumnoi, on the western end of Unimak, is extinct, but on Akutan, the next island, there is an active volcano of the same name. One unusually favorable day in August, 1892, Mr Charles H. Townsend, of the United States Fish Commission, and I climbed one of the peaks of Unalaska bay, which brought Akutan in full view. To our great surprise, we saw gigantic rings of smoke, such as sometimes come in miniature from the smokestacks of locomotives, issuing from the crater at regular intervals of about twenty minutes. As each succeeding ring appeared, its predecessor was slowly breaking up and fading away in the air. Four such rings were seen, but how long the display lasted it was not possible to determine, as the peak became obscured in drifting banners of fog.

On Unalaska island is the huge volcanic mass of Makushin, between 5,000 and 6,000 feet high. From the reports of those who have ascended Makushin, it would seem that fumarole action is all that is left of its plutonic fires; but earthquakes, some of decided vigor, are annually felt in the locality, while the many adjacent cinder cones and craters testify to the activity of other days.

Some 40 or 50 miles from Unalaska in a north of west direction are the two tiny dots of rock which compose Bogoslov (Joánna Bogoslóva), whose origin was within historic time and whose form has undergone changes quite recently. Columns of steam steadily rise from one of the mounds, and here the warm earth temperature is now utilized, as some one has playfully suggested, to assist in the hatching of the eggs of the myriads of guillemots which, in company with a colony of sea-lions, occupy these volcanic remnants. The other member of the group, connected with its neighbor by a low-lying strip of sand, is without heat.

Suggestions concerning the exploration of these areas would be incomplete without reference to methods of reaching them. A mail boat now makes a monthly trip from Sitka to Unalaska. This boat is under the control of the Pacific Steam Whaling Company, a corporation which would willingly extend a helping hand to such work. It would not be difficult to get this vessel to stop at the village of Morshovia, past which it goes, where could be readily secured the services of such men as Rosenberg and Swanson, who own a hunting cabin at the base of Shishaldin and have boats and suitable equipments for transportation. They could also obtain from among their Indian friends the necessary packers. The approach would have to be made from the Pacific side, as here the ground is high, barren, and rolling, while on the Bering Sea side there are lakes and swamps which would make travel difficult if not impossible.

From Morshovia the mail steamer on its next monthly trip could move the party to Unalaska bay, where are located the comfortable stations of the North American Commercial Company and the Alaska Commercial Company, both of which corporations would doubtless render all possible assistance to such an expedition. Here also the aid of a revenue cutter or that of a small schooner could be secured to make the short trips to Akutan and Bogoslov. The Revenue Cutter Service has won a high place for itself in the field of travel and of exploration, and is always in sympathy with such matters. At Akutan, some twenty or thirty miles from Unalaska, there is an Indian village within a beautiful land-locked harbor. Here the party could be left for ten days or two weeks, guides and packers secured from the Indian village, and the ascent and exploration of the volcano of Akutan readily accomplished. Bogoslov could be explored in a round trip of two days or possibly less from Unalaska, if the conditions for landing were favorable. Using the commer-



BOGOSLOV ISLANDS — ALEUTIAN ARCHIPELAGO

cial company's stations as a base of supplies and assistance, the ascent of Makushin could be made direct from Unalaska, and that volcano fully investigated in about three or four days.

Dr Dall,* in his work on Alaska, has presented a very interesting and instructive chronological tabulation of the activities of the volcanoes of Alaska, from which it would appear that there has been great diminution of energy with the passage of time. The systematic exploration and study of these volcanoes, as well as the associated volcanic areas, are well worth the attention of geographic societies in America, or those who can command leisure and a little money; but perhaps we shall have to wait, as in the case of Mt St Elias, for another Prince Luigi to come and tell us the facts concerning Shishaldin and Akutan.

MAGNETIC WORK OF THE COAST AND GEODETIC SURVEY

By L. A. Bauer,

Chief of Division of Terrestrial Magnetism

From the date of the organization of the Coast Survey the supplying of magnetic data to the land surveyor and the mariner has formed one of the chief functions of its work. With every year the demand for such data has become more and more pressing, so that the present superintendent, Dr Henry S. Pritchett, has found it necessary to form a distinct division for magnetic work. The work that it is proposed to carry out with the enlarged opportunities may be briefly classified as follows:

1. *Magnetic Survey of Land Areas under the Jurisdiction of the United States.* The three elements, magnetic declination or "variation of compass," magnetic inclination or dip, and the intensity of the magnetic force, will be determined at stations on the average 25 to 30 miles apart. As the endeavor will be to observe at about 500 stations per annum, it is estimated that the complete survey of the country will take about ten years. The short-period variations, as the diurnal variation of the magnetic declination, will be eliminated with the aid of the continuous observations at the magnetic observatories, while the

* Dall (W. H.): Alaska and its Resources, pp. 467–470.

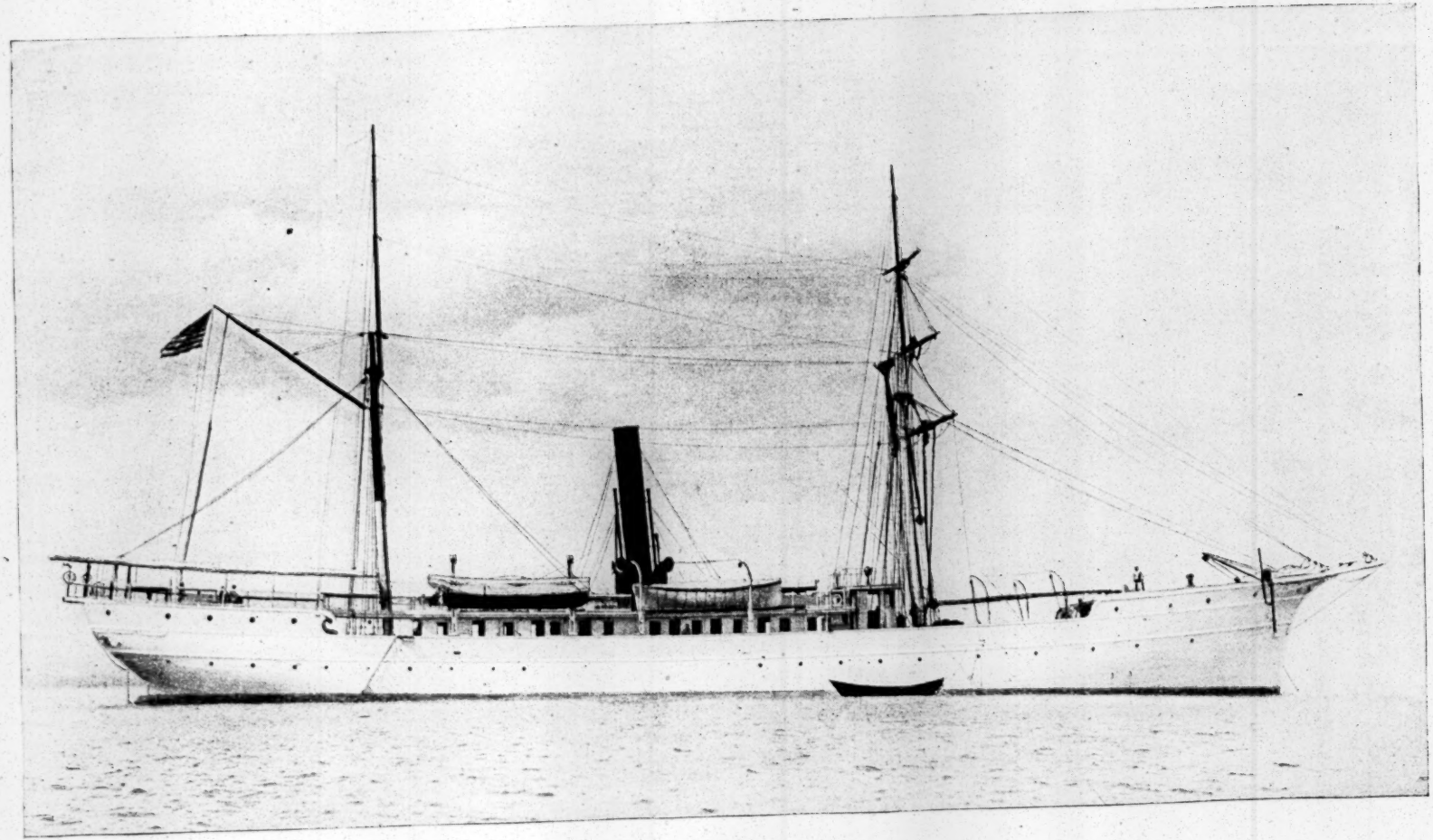
corrections for secular variation will be made with the aid of observations repeated at certain intervals at so-called "repeat" or "secular variation" stations. The Survey likewise is coöperating with the various state geologists in the carrying out of detailed state magnetic surveys. This work consists in the establishment, at the county-seats, of true meridian lines for the use of the surveyor and in the detection and mapping out of regional magnetic disturbances and the correlation of the latter with geologic formations.

2. *Magnetic Survey of Ocean Areas.* When the great rôle which the compass plays in the art of navigation is recalled, it seems remarkable that our country has done so little systematic work in the determination of magnetic elements at sea. In supplying compass directions on its charts the Survey is feeling keenly the need of more accurate data. It is a well-known fact that at the very places—near coast lines and over submerged land areas—where danger from shipwrecks is greatest the compass directions, taken from present charts of the lines of "equal magnetic variation," are weakest. At these places these lines will present the same peculiar curvatures and interlacings that we find over the land areas. The Survey therefore proposes to contribute its adequate share toward remedying these defects and is making ample provision for carrying on such work systematically in the future. This work will be of a twofold character:

a. Determination of magnetic elements at shore stations.

b. Determination of magnetic elements at sea, the dip and relative intensity being obtained with the Fox dip circles.

3. *Continuous Observations at Magnetic Observatories.* To make possible the rapid and economical execution of the plans just set forth, three well-equipped magnetic observatories will be established, viz., one near Washington city (this to be the central or standard observatory, at which the constants of all magnetic instruments will be determined), one on the Pacific coast, and another on the Hawaiian islands. These observatories, with the coöperation of those at Toronto, Habana, Mexico, and Manila, and some temporarily established observatories for recording the variations of the declination, will suffice for the practical needs of the magnetic survey work. Their function will be to record and to fix the countless variations and fluctuations of the earth's magnetism and thus make possible the reduction of all magnetic observations to a common epoch.



THE ALBATROSS

DEEP-SEA EXPLORING EXPEDITION OF THE STEAMER "ALBATROSS"

By Hugh M. Smith,

U. S. Commission of Fish and Fisheries

Unusual public interest has been manifested in the recent announcement of Hon. George M. Bowers, United States Commissioner of Fish and Fisheries, that the steamer *Albatross*, belonging to the Commission, would soon be dispatched on an exploring expedition to the Pacific ocean, the President having approved the detail of the vessel for that purpose. With the main objects of the expedition fully determined on, the arrangements for the cruise about completed, and the itinerary mapped out, it is now possible to give an outline of the leading features of the voyage.

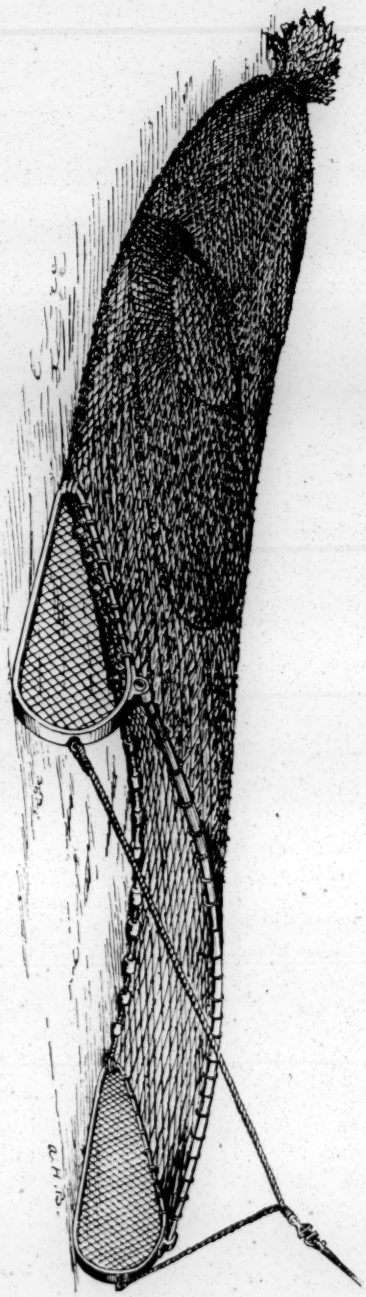
The *Albatross* is the best-equipped vessel afloat for deep-sea investigation, for which work she was especially constructed for the Fish Commission in 1882, at a cost of nearly $200,000. She is a twin-screw steamer of 384 tons burden, 234 feet long and 27½ feet beam. The coal capacity is about 240 tons, and the steaming radius with that supply, in good weather, is over 4,500 miles, allowing a speed of eight knots an hour and a daily coal consumption of 10 tons. A full account of the construction of the *Albatross* and her appliances for marine investigation has been given in the admirable work on "Deep-sea Exploration," by Commander Z. L. Tanner, U. S. N., under whose direction the vessel was built and who was in command from the date of her launching until 1894. The reputation long enjoyed by the *Albatross* of being unequaled in effectiveness for marine research will be more than ever deserved on the approaching cruise because of the extensive improvements and repairs she has recently undergone, including the installation of new boilers, ice-making machine, cold-storage plant, etc., together with the thorough replenishing of the scientific outfit.

The *Albatross* will pass through the Golden Gate on August 21 and begin her long voyage to certain groups of islands in the middle of the Pacific ocean, both north and south of the equator, whose local fauna is almost unknown, while in the adjacent

waters little or no scientific investigation has been carried on. The Society islands will be first visited, although the vessel will touch at the Marquesas islands for coal. Between San Francisco and Tahiti, a distance of 3,500 miles, dredging and sounding will be carried on at regular intervals on a section of the sea-bottom almost wholly unexplored. Tahiti will be the headquarters while the Society islands and the Paumota islands are being explored. In the latter archipelago, which is about 600 miles long, six or eight weeks will be spent and important scientific discoveries should be made. In the Tonga or Friendly islands, distant about 1,500 miles from the Society group, a week or ten days will be passed. The vessel will then proceed to the Fiji islands, where a short stay will be made, and thence 1,700 miles to the Marshall islands, in which interesting archipelago, of whose natural history almost nothing is known, six or seven weeks will be devoted to exploration. The Ellice and Gilbert islands, lying between the Fiji and Marshall islands, will also be visited. It was originally the intention to have the *Albatross* proceed from the Marshall islands to the Hawaiian islands and thence to San Francisco, running a line of deep-sea dredgings along the entire route; but, owing to the prevalence of head winds at the time when the vessel will be ready to leave the Marshall islands, this plan has been abandoned, and instead the vessel will sail for Japan, making frequent use of the dredge and the deep-sea tow-net and setting the trawl in the moderately deep water off the Japan coast, where the fishermen are continually bringing up curious forms. The voyage of nearly 20,000 miles will come to an end at Yokohama, where the *Albatross* will arrive in April, 1900, and refit for a summer cruise to Alaska to resume the systematic examination of the salmon streams begun several years ago.

The leading features of the expedition will be deep-sea dredging, trawling, and sounding, and some special appliances for such work have been constructed. A wire dredge-rope 6,000 fathoms long has been made to order, and to accommodate this enormous quantity a special drum has had to be prepared. It is expected that both the dredge and the beam-trawl will be hauled in deeper water than heretofore. One of the novel pieces of collecting apparatus is a beam-trawl of unprecedentedly large size, especially designed for the capture of larger animals than can be taken with the usual apparatus. What results may attend its use can only be conjectured. The iron framework consists of

two runners 6 feet long and 4 feet high, connected by a 20-foot beam, which has an upward curve of 2 feet from the horizontal in order to increase the size of the entrance of the net. Fitted to this frame is a bag 30 feet long, made of $\frac{3}{16}$-inch twine, with an 8-inch mesh; a funnel-shaped throat is attached 7 feet back from the lead-line. The mouth of this trawl is twice the size of that of the largest trawl heretofore constructed. The wide mesh permits the escape of the mud and finer bottom material which contribute so much to the weight when the ordinary small-mesh trawls are lifted.



BEAM-TRAWL — DESIGNED BY C. H. TOWNSEND

While the deep-sea investigations will receive the most attention, surface and intermediate towing, shore-seining, and fishing trials with lines, gill-nets, and other appliances will be regularly carried on and will undoubtedly yield rich collections. This is a region abounding in atolls and elevated reefs, many of which will be visited and studied for the purpose of obtaining data bearing on the disputed question of the origin of coral reefs.

The *Albatross* is manned by about 10 officers and 70 petty officers and enlisted men of the United States Navy. The commanding officer is Lieutenant Commander Jefferson F. Moser, U. S. N. The civilian staff on

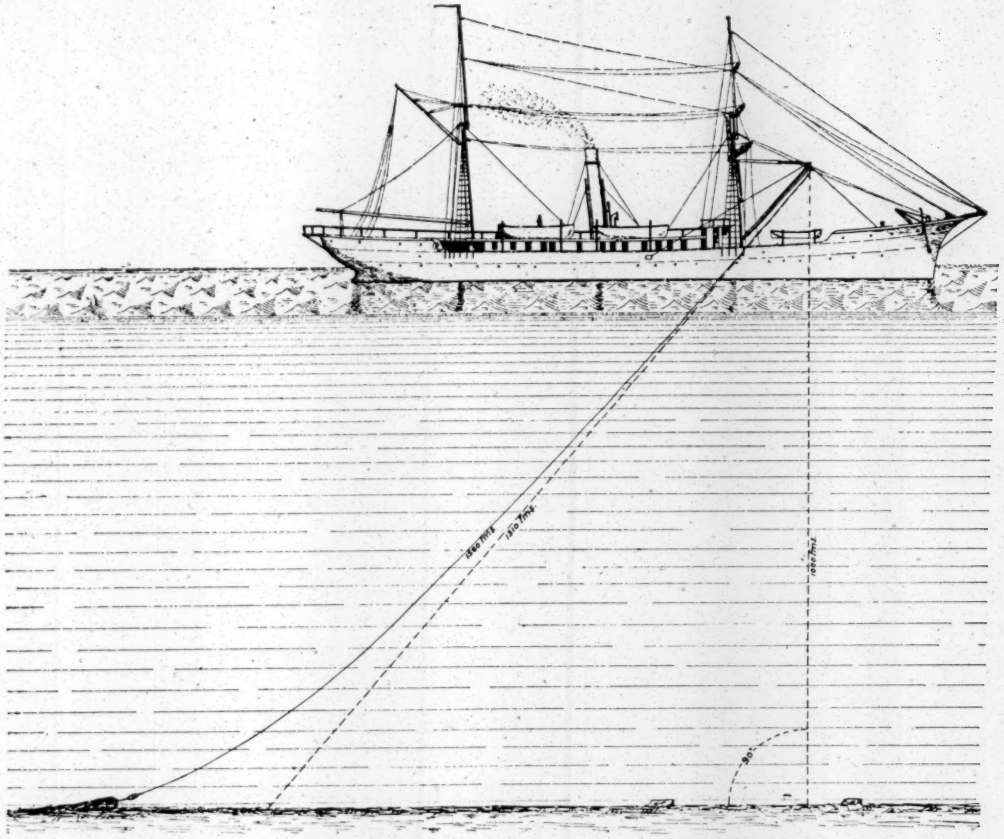


DIAGRAM SHOWING DEVIATION OF DREDGE-ROPE FROM A PERPENDICULAR LINE OF 1,000 FATHOMS

this expedition consists of Professor Alexander Agassiz, in charge of the scientific work, who will be accompanied by his son and his personal assistants, Dr W. McM. Woodworth and Dr A. G. Mayer, of the Museum of Comparative Zoölogy, Cambridge, Mass.; Dr H. F. Moore, chief naturalist of the *Albatross;* Mr Charles H. Townsend, former naturalist, now chief of the fisheries division of the U. S. Fish Commission; Mr A. B. Alexander, fishery expert, and Mr H. G. Fassett, photographer, both of the U. S. Fish Commission.

Opportunity will undoubtedly be afforded for conducting a number of important collateral inquiries without detriment to the regular scientific work. Advantage will be taken of every chance to obtain for the National Museum specimens of the mammals, birds, insects, and other land animals of the various islands visited. A study of the aboriginal fishing methods, apparatus, and boats, and the collection of specimens of the native fishing appliances will be in charge of the fishery expert.

The Smithsonian Institution has specially requested that the Fish Commission make an effort to trace the origin of some of the ethnological specimens brought back from the Pacific islands by the Wilkes Exploring Expedition. Owing to the indifferent care which the collection received during early years, many of the labels were lost and the articles thus rendered practically worthless. Photographs and descriptions of such specimens will be furnished by the Smithsonian Institution in the hope that the *Albatross* may ascertain something about them. Inasmuch as such an opportunity may never again arise to secure for the National Museum articles illustrating the arts and customs of the natives of these isolated islands, which are rapidly yielding to the influences of civilization, Commissioner Bowers has notified the Smithsonian Institution that the naval and civil attachés of the vessel will be given special instructions to be on the lookout for desirable ethnological material.

In order that the movements of the vessel in the islands to be visited may be facilitated, the Department of State has, through our ambassadors, notified the British, French, and German authorities of the approaching cruise, and asked that tariff and other regulations be waived.

There is every reason to believe that this expedition will yield valuable scientific results and will be creditable to the country. It promises to be by far the most important marine expedition on which the Fish Commission has embarked and

one of the most pretentious scientific enterprises in which the government has ever engaged. It is a matter for congratulation that, in the activity in exploration of the seas now being exhibited by the British, German, French, Dutch, and Norwegian governments, the United States will participate under such favorable auspices and be represented by a scientist of such wide experience in deep-sea investigation as Professor Agassiz.

GEOGRAPHICAL CONGRESS AT BERLIN

The delegates of the National Geographic Society to the Seventh International Geographical Congress, which will be held at Berlin from Thursday, September 28, to Wednesday, October 4, under the auspices of "die Gesellschaft fur Erdkunde zu Berlin," are as follows: Dr Alexander Graham Bell, President of the Society; Gen. A. W. Greely, U. S. A., also designated by President McKinley to represent the United States government; Hon. Andrew D. White, U. S. Ambassador to Germany; Prof. Willis L. Moore, Chief of the Weather Bureau; Miss Eliza Ruhamah Scidmore, Foreign Secretary of the Society; Mr Marcus Baker, of the U. S. Geological Survey; Dr L. A. Bauer, of the U. S. Coast and Geodetic Survey, and Prof. Wm M. Davis, of Harvard University.

Antarctic exploration will occupy the most prominent place in the deliberations, for Captain Drygalski and Dr Neumayer and Sir Clements Markham will earnestly strive for the definite coöperation of the German and British expeditions that are to be sent out in the autumn of 1901. Prof. Penck, of Vienna, will reopen the discussion of his proposed map of the world on a scale of 1 : 1,000,000, which at the last Congress, in London, 1896, was referred to a committee for report at this meeting. In the section of physical geography Prof. Wm. M. Davis will contribute a paper on The Geographical Cycle, and also one on Land Forms due to Glacial Erosion, while Poultney Bigelow, under the head of political geography, will discuss Colonial Government in different parts of the World. Other papers will be contributed by Prof. Supan, Sir John Murray, Prof. Wagner, Dr Oscar Lenz, the Prince of Monaco, Dr Futterer, and Miss L. A. Owen, of St Joseph, Mo. The committee in charge of the Congress have arranged for a delightful series of excursions to places of geographic interest within a day's reach of Berlin.

THE PROPOSED AMERICAN INTEROCEANIC CANAL IN ITS COMMERCIAL ASPECTS

By Joseph Nimmo, Jr, LL. D.

The question as to the practicability of either the Nicaragua or the Panama Canal project depends upon three classes of considerations, viz., those relating to its engineering aspects, involving questions as to cost; those relating to its commercial possibilities, and those relating to its military importance.

The government of the United States has thus far confined its inquiries almost exclusively to the engineering features of the project. During the last four years three engineering commissions have been appointed, viz., the "Ludlow Commission," authorized by act of January 28, 1895; the "Walker Commission," authorized by act of June 4, 1897, and a commission of nine persons, authorized by act of March 3, 1899, and appointed by the President June 9, 1899. Rear-Admiral Walker is also chairman of this commission. There was appropriated by Congress for the Ludlow Commission $26,176; for the commission of 1897 the sum of $300,000, and for the commission of 1899 the sum of $1,000,000. So it appears that the total sum of $1,326,176 has been appropriated within four years for the purpose of ascertaining the engineering features and the cost of constructing an American interoceanic canal, but up to the present time not one cent has been appropriated by Congress for the purpose of ascertaining the probable commercial value of the project—*i. e.*, the amount of shipping which would pass through it. The proponents of the Nicaragua Canal scheme have from the beginning opposed any governmental investigation whatsoever as to the practicability of their project. Such objections have been overruled by Congress as to the engineering aspects of the enterprise, but, singularly enough, have prevailed with respect to the commercial, the economic, and the military aspects of the scheme. The advocates of the canal declare that the commercial necessity for its construction is so clear that it needs no investigation. That is monstrous. It goes in the face of common sense and of every dictate of prudence. Section 231 of the Revised Statutes of the United States provides that "there shall be prepared and

submitted to Congress, in connection with the reports of examinations and surveys of rivers and harbors hereafter made to Congress, full statements of all existing facts tending to show to what extent the general commerce of the country will be promoted by the several works of improvement contemplated by such examinations and surveys." But, in the face of this provision of law touching the ascertainment of the commercial value of improvements of navigation within our own borders, the proponents of the Nicaragua Canal in Congress and out of Congress have for years been urging the government to lend them one hundred million dollars for the construction of a canal in a foreign country, more than one thousand miles from our shores, without any official inquiry whatsoever as to its probable commercial value.

In his book entitled "The Nicaragua Canal and the Monroe Doctrine," Professor Keasbey says: "What we need is another board of experts to study the commercial effects of the canal." The Hon. Thomas B. Reed, in his article in the *North American Review* for May, 1899, in referring to "the possible tonnage which would pass through the Nicaragua Canal," says: "It would seem, therefore, that after the question of cost is determined, or perhaps while it is being determined, a commission of competent persons, unprejudiced, should be invited to study this part of the subject. We shall then be equipped with the necessary facts to enable us to judge of the commercial success of the undertaking."

Near the close of the last Congress the fact seemed to have dawned upon the minds of certain leading Senators and members of Congress that the commercial inquiry should have preceded any appropriation for the construction of the canal; but the act of March 3, 1899, appropriating one million dollars for the examination of both the Nicaragua and the Panama routes, refers only to the engineering, the proprietary, and the financial features of those schemes, and contains not a word as to their commercial, economic, or military aspects. Action has, however, been taken whereby a committee of three of the commission of nine has been assigned to the duty of inquiring into these particular aspects of the subject. This is not in terms authorized by law, but it appears to be the beginning of an inquiry of deepest interest to the people of the United States.

It is the object of this paper to present some of the more important geographic, commercial, and economic conditions which

determine the commercial possibilities of any American isthmian canal, and to show the importance of their thorough investigation by specific provision of law before committing the government to any financial obligations for construction.

Neither the Nicaragua Canal nor the Panama Canal would afford the shortest or the most practicable route for the trade of the Atlantic seaports of the United States or for the trade of the countries of Europe with Asia or Australasia. This is placed beyond all question by the following statement of distances furnished to me, under date of June 10, 1898, by the Superintendent of the United States Coast and Geodetic Survey:

	Nautical miles.
From Manila to New York:	
Via Suez Canal	11,565
Via Nicaragua Canal	11,746
From Manila to London:	
Via Suez Canal	9,600
Via Nicaragua Canal	14,680

This indicates that the Suez route has an advantage of 181 miles over the Nicaragua route for the trade of New York with Manila, and an advantage of 5,080 miles over the Nicaragua route for the trade of London with Manila. The Suez Canal is, however, a sea-level canal, whereas the Nicaragua Canal involves 220 feet of lockage. In respect to the important consideration of coaling facilities, having regard both to location of coaling stations and the price of coal, the Suez Canal route is also greatly superior to either the Nicaragua or the Panama route. Taking all these facts into consideration, it is evident that the Suez Canal possesses an equivalent advantage of fully 1,500 miles over the Nicaragua or the Panama Canal route with respect to the commerce of the Atlantic seaports of the United States with Asia and Australasia, and of fully 6,000 miles with respect to the commerce of the various countries of Europe with Asia and Australasia.

The rainfall at the eastern end of the Nicaragua Canal has amounted to 25 feet in a single year, whereas the average annual rainfall at Suez is only about two inches. The enormous precipitation at Nicaragua not only vitally affects the question as to the permanence of earthworks but has a material bearing upon the question of navigation. A careful observer of engineering works on the American isthmus and contiguous territory declares that all maximum estimates of cost of construction in

the United States should be multiplied by 2½ in order to obtain the cost of similar earthworks on the American isthmus on account of the enormous precipitation in that part of the globe.

It is claimed by the proponents of the two American interoceanic canal projects that the commerce of the Pacific Coast states of the United States with that portion of the country which lies east of the Rocky mountains will afford a large amount of traffic for either of the proposed canals. This has little support in commercial, geographic, or economic conditions. About two-thirds of the people of the United States reside west of the Appalachian range. The principal commerce of our Pacific Coast states is with that portion of the country which lies west of this line and east of the Rocky Mountain range. The average distance from all points of production and consumption in the Pacific Coast states to all points of production and consumption in the area between the Rocky Mountain range and the Appalachian range by direct rail lines is only about one-third the average distance between such points by the Nicaragua or Panama route. Besides, the direct rail route is greatly superior to the water route with respect to speed, facilities for the collection and distribution of freights, and the avoidance of those transshipments of cargo which would be necessary in the case of goods shipped by the canal route. The same is true as to merchandise of all sorts shipped from points east of the Rocky mountains to both interior points and to seaports of the Pacific Coast states. It is also beyond all question that the transcontinental rail lines will for all time secure the entire carriage of passengers, the mails, bullion, express goods, perishable goods, and fast freights generally, and that by an inevitable law of the economics of transportation they will also secure the carriage of nearly all the rest of the traffic in general merchandise between the Atlantic and the Pacific coasts. This is matter of common experience throughout the country. The transcontinental railroads are now extensively engaged in the transportation of raw material and gross products for long distances. Among these commodities may be mentioned coal, lumber, ores, and agricultural products of every description. It is manifestly absurd to assume that Chicago, St Louis, Cincinnati, and hundreds of other centers of trade will ever engage in trade with the Pacific Coast states by the way of the Nicaragua or Panama Canal; such traffic will for all time be carried on over direct rail lines. This is an inevitable result of the wonderful re-

duction which has been made in the cost of transportation by rail. The average rail rate in the United States is now only about one-third the average of the rates which prevailed thirty years ago. A report, prepared in 1898, under the direction of the Statistician of the Department of Agriculture, on Changes in the Rates of Charge for Railway and other Transportation Services, shows (p. 49) that rail rates per 100 pounds on carload lots from Pacific Coast terminals to the port of New York were in the years 1870 and 1897 as follows:

Rate on canned goods, $3.66 in 1870 and 75 cents in 1897; on dried fruit, $3.66 in 1870 and $1.00 in 1897; on raisins, $3.66 in 1870 and $1.00 in 1897; on wine in wood, $4.79 in 1870 and 75 cents in 1897, and on hops, $3.66 in 1870 and $1.50 in 1897.

A corresponding table on page 50 of the report just mentioned shows that rates per 100 pounds from New York to Pacific Coast terminals in carloads were reduced as follows: On stoves, from $3.66 in 1870 to $1.10 in 1897; on glassware, from $5.66 in 1870 to 85 cents in 1897, and on agricultural implements, from $3.48 in 1870 to $1.15 in 1897.

The foregoing characteristic data indicate that the present rail rates between the Atlantic and Pacific coasts of the United States are only about one-fourth the rates which prevailed during the year 1870. There is a pressing need that these important commercial facts shall be brought to the attention of Congress and of the country by a competent and impartial commission charged with that duty.

The assumption that large quantities of cotton would be shipped from New Orleans and other Gulf ports to Asia *via* the Nicaragua or Panama Canal is negatived by the fact that at current rates cotton can be shipped more quickly and at less expense from points of production in our southern states to San Francisco by rail and thence by ship to Asia. There is a difference of more than 2,000 miles in favor of the overland route.

The assumption that coal can be profitably transported from the mines of Virginia and West Virginia to San Francisco is also absolutely negatived by current prices of coal at Atlantic and at Pacific ports, the cost of transportation and the canal toll, assuming it to be $1.80, the present Suez Canal rate. Nevertheless, through false representations, the assumptions as to cotton and coal have to some extent taken possession of the public mind, and therefore should become the subject of careful investigation by a properly organized governmental commission.

In this connection there arises an important question as to markets. The value of the products of all industries in the states of the Pacific coast and in the so-called arid region is fully $700,000,000 annually. This gives rise to an enormous commerce with the states east of the Missouri river. Chicago, St Louis, St Paul, Minneapolis, Cincinnati, and other interior cities are now the centers of that commerce over direct lines. Hence arises the important question as to whether the people of those cities and of the entire western and northwestern states are or are not in favor of the payment of a capital subvention probably amounting to at least $200,000,000 and an additional subvention on account of interest and maintenance of works amounting annually to at least $9,000,000 for the purpose of diverting this great trade to rival commercial centers.

The utter absurdity of the proposition that the Nicaragua Canal would be of any possible benefit to the great interior cities or to the entire western and northwestern section of this country is also indicated by the following statement of distances:

San Francisco to Chicago:	Miles.
By direct rail line	2,356
By Nicaragua route and rail	5,803

The seaport cities of the Pacific Coast have also to face the question as to whether they are or are not in favor of such Panama or Nicaragua Canal subventions having in view the object of diverting our commerce with Asia and Australasia from Pacific Coast ports. This inquiry is accentuated by the fact that Honolulu, the intermediate coaling station of the Pacific Ocean, is 1,142 statute miles south of San Francisco. I have no faith in the potentiality of such subventions upon the course of commerce for reasons of an economic and commercial nature herein set forth, but merely allude to the obvious purpose and tendency of such subventions and to the necessity for honest and thorough official inquiry into the matter.

Neither the Panama nor the Nicaragua Canal will ever be available for sailing vessels on account of lack of wind and towage charges. This constitutes one of the most important conditions affecting the practicability of any American interoceanic canal. It would be necessary not only to tow sailing vessels through any American canal, but also, as a rule, to tow them to and from the canal through the Doldrums. For the same reasons no

sailing vessel ever passes through the Suez Canal. The enormous precipitation at Nicaragua and at Panama increases the difficulty at the American isthmus.

Proponents of the American canals imagine, however, that upon the completion of their projects sailing vessels will give place to steamships. That is highly problematical. Sailing tonnage is fairly holding its own in the ports of the globe, especially for long voyages. The following was the composition of the American merchant marine for the year 1898:

	Tons.
Tonnage of sailing vessels	2,377,815
Tonnage of steam vessels	2,371,923

This shows the tonnage of sailing vessels to be somewhat in excess of that of steam vessels. Besides the carrying capacity of sailing vessels considerably exceeds that of steam vessels on account of space occupied on the latter by boilers, engines, and coal. The total tonnage of vessels entered at and cleared from ports of the Pacific coast of the United States in trade with Europe during the year 1898 amounted to 821,010 tons, of which only 1,199 was steam tonnage, the rest being composed of large sailing vessels. Sailing vessels pursuing the Cape Horn route require much more time than would steamers by the canal route, but are much more cheaply operated and afford the important advantage of storage at sea. Besides, steam vessels would incur the expense of tolls on the canal, which at the rate lately current on the Suez Canal—$1.80 per ton—would amount to $7,200 on a 4,000-ton steamer for each passage. Sailing vessels are still largely employed in the trade of Great Britain with Australia and with China and Japan. Such vessels pursue the route *via* the Cape of Good Hope and never take the Suez Canal route. This is a subject which should be carefully investigated and reported upon by a competent and impartial commission duly authorized by order of Congress. There is now a large number of sailing vessels in course of construction in this country and the owners of these vessels face the future with confidence in the success of their ventures.

The commerce of the western coast of South America, including Chile, Peru, Ecuador, and the United States of Colombia on the Pacific, is sharply conditioned by that broken and irregular mountain range which extends from Alaska to Cape Horn—the most striking orological feature of the western continent. That part of this range known as the Andes skirts the western shore of South America and practically limits the foreign com-

merce of this coast to the narrow strip of country embraced within its western slope. This commerce centers at Valparaiso, the chief seaport of Chile, and is carried on mainly by means of steamer lines which pursue the Straits of Magellan route and ply between Valparaiso and New York and between Valparaiso and ports in Europe. The commercial success of the vessels of these lines depends very largely upon the fact that they touch and trade at ports on the eastern coast of South America. The principal of these ports are Buenos Ayres, Montevideo, Rio de Janeiro, Bahia, Pernambuco, and Para; also ports in the West Indies. It is certain that for the reason just stated no considerable part of this commerce would be diverted to any American isthmian canal.

Besides, the exportable products of the west coast of South America are essentially sailing-vessel cargoes, consisting mainly of the nitrates, copper, wheat, coal, manganese ore, barley, copper ore, and wheat flour. A considerable part of the import cargoes into the countries of this coast are also sailing-vessel cargoes; but, as before shown, it will be entirely impracticable to navigate sailing vessels through any American isthmian canal.

There is a comparatively small amount of commerce which moves northward to Panama. According to the best available data, it amounts to about 230,000 tons of shipping annually. The possibility of its development is confined mainly to a narrow strip of country comprising the west slope of the Andes, north of Callao.

The attempt has many times been made to prove inferentially that an American isthmian canal must succeed because the Suez Canal has proved to be a success. This is not argument; it is idle vaporing. Inferences may be projected from similar but not from dissimilar circumstances and conditions. It would be quite as logical to infer the failure of the Nicaragua or Panama Canal from the failure of canals in various parts of the world as the result of railroad competition as to infer the success of such canal from the success of the Suez Canal or of the Sault Ste Marie Canal of the United States. The commercial failure of the Manchester Canal, the Kiel Canal, and the Corinth Canal are examples in point; so is the abandonment of canals in all parts of this country, notably the recent abandonment of the Delaware and Hudson Canal. The President of the Delaware and Hudson Canal Company, which is now exclusively a railroad company,

states in his last annual report that the canal belonging to that company was abandoned because "the cost of transportation by that route was too great as compared with other methods." In a letter dated July 8, 1899, the secretary of the company informs me that the views expressed in the report just mentioned "have been more than vindicated by subsequent results in the company's operations."

The enormous falling-off in the tonnage of the Erie and Welland Canals, and the changes and astounding reductions in the traffic of rivers in all sections of this country as a result of the competition of rival railroads point in the same direction. During the 16 years from 1876 to 1892 the tonnage of freights transported on the lower Mississippi fell 41½ per cent, the tonnage on competing railroads increased 350 per cent, and the sea traffic of New Orleans increased 70 per cent. This deflection of commerce from the Mississippi to competing railroads is still going on.

The Sault Ste Marie Canal has no parallel in the world as to the commodities which pass through it or the conditions under which its commerce exists. Any attempt, therefore, to predict the success of the Nicaragua or Panama Canal from the success of the Sault Ste Marie Canal is glaringly absurd.

The Suez Canal connects great commercial and industrial nations, whereas the most striking physical aspect of any American isthmian canal is that it would connect two vast unproductive oceans. The Suez Canal has no competing railroad, but the wonderful progress of railroad building in Asia and the grand schemes of railroad construction now being agitated in Europe and in Persia, India, and China seem to forecast an era of railroad construction which in time will seriously affect the traffic of the Suez Canal. A single competing railroad as effective as any one of the transcontinental lines which connect the Atlantic and Pacific coasts of the United States would at once take from the Suez Canal the entire carriage of passengers, the mails, express goods, perishable goods, and fast freights generally, leaving to it only the lower class of freights, for which sailing vessels, by the old Cape of Good Hope route, would be, as they are today, sharp competitors. This is an economic fact beyond all question.

Let the government of the United States institute a thorough and impartial investigation of all these conditions, and no longer leave them to be determined by the speculations of canal proponents, who not only fail to make known the facts upon which

their own estimates of tonnage are based, but vigorously oppose any governmental attempt to institute practical inquiries into the subject, at the same time being ardent applicants for enormous subventions from the national treasury in aid of their particular undertakings.

The idea that the Nicaragua or Panama Canal route, even at the present rate of tolls charged on the Suez Canal, about $1.80 per net ton of shipping, will secure the traffic in wheat and lumber from the Pacific coast to the countries of Europe or to other countries and islands on the eastern side of the American continent is subject to serious question. Wheat, lumber, and coal transported on long voyages are essentially sailing-vessel cargoes; but, as before shown, it will for all time be impracticable to navigate sailing vessels through any American interoceanic canal, for the same reason that no sailing vessel ever passes through the Suez Canal.

The records of commerce across the Isthmus of Panama during the last fifty years serve to throw light upon the question as to the practicability of an American interoceanic canal. The construction of the Panama Railroad was begun in the month of May, 1850, and it was opened for traffic January 28, 1855. The length of the road is 47½ miles. The cost of its construction was $8,000,000. It continued to be the principal avenue for commerce between the Atlantic and Pacific coasts of the United States until the completion of the first transcontinental railroad, the Union and Central Pacific, on May 10, 1869. During the year ended June 30, 1869, the total value of merchandise shipped from New York to San Francisco and from San Francisco to New York *via* Panama amounted to $70,202,029. As the result of transcontinental railroad competition, it fell in the following year, to $18,594,255. During the year ended June 30, 1898, it amounted to only $4,887,289. Upon the completion of the Union and Central Pacific railroad line in 1869, the carriage of passengers, the mails, coin and bullion, express goods, perishable goods, and all the more valuable "fast freights" was at once deflected to the transcontinental railroad, nevermore to be transferred to any possible trans-isthmian rail or water route. Since the year 1869 eight other transcontinental lines and parts of lines have been constructed, and direct connections have been formed with lines reaching to every center of trade and of production in this country from the Atlantic to the Pacific and from Canada to the Gulf.

Thus an enormous internal and transcontinental traffic has sprung up. The total freight traffic of the Panama Railroad, through and local, embracing freights to and from the entire western coast of North America, Central America, and South America, amounted during the year 1897 to only 290,651 tons, whereas the tonnage carried across the continental divide by rail, according to the best means of information, amounted to over 3,000,000 tons, and included freights of every class, from the highest to the lowest. Besides, an enormous local traffic has sprung up along the transcontinental lines and their branches. A vast area has thus been reclaimed to the arts of civilization. The seventy-ton steel locomotive and the eighty-pound steel rail have become the chief instrumentalities of the grandest and most efficient system of transportation ever seen on this globe, and the demand for still larger achievements is imperative. The one-hundred-ton steel locomotive has been built, the one-hundred-pound steel rail has been laid, and the practicability of the one-hundred-and ten-pound steel rail is affirmed. The determining economic factor in the case is not railroad grades or mountain summits or continental slopes, but *coal, the price of coal.* It is a mere question of fuel, and nature has granted to our country superabundant supplies of that invaluable source of power. The result is that the quest of the early navigators for a natural waterway through the western world and the vagaries of American interoceanic canal propagandists have become or are fast becoming things of the past—the mouldy past.

The commerce of Colon at the eastern terminus of the Panama Canal is very largely incidental to other and more important traffic. Steamers embark from ports in Europe for ports in South America, Central America, and the West India islands, touching at Colon, as they do at other ports *en route.* The same is to a considerable extent true as to the commerce of Panama at the Pacific terminus of the Panama Railroad. In a word, neither the Panama Canal nor the Nicaragua Canal is on the line of any great independent commercial movement, but if completed would occupy the position of lateral lines to comparatively small commercial movements, the terminus of either canal being merely points at which certain ocean steamer lines would touch and trade.

In December, 1898, the American interoceanic canal question assumed a new aspect. The "New Panama Canal Company," a French enterprise (as was its predecessor, the Panama Canal

Company, of which the late Count de Lesseps was president), presented to Congress and to the President of the United States certain picturesque and elaborately prepared documents with the object in view of proving that it would be much better for the government of the United States to grant large financial aid for the completion of that enterprise than to construct the Nicaragua canal. Under the title "The Traffic of the Panama Canal," the report presented by this company merely states that it has adopted a new method of computing the probable tonnage of the proposed canal and that the results obtained are most exact. But, strangely enough, like all the deliverances of the Nicaragua Canal proponents, it fails to state what those results are, from what particular commercial movements the expected tonnage is to come, or of what products its traffic is expected to be composed. The amount of shipping which would probably pass through either of the proposed canals is the vital point upon which the practicability of any American isthmian canal must turn. Failure to state it, at this time, must therefore stand as a confession of the commercial unworthiness of any trans-isthmian scheme until the question as to its commercial possibilities has been placed beyond all doubt. Nevertheless the proponents of the Panama Canal were able to lead Congress to order a new American interoceanic canal commission, at the enormous outlay of one million dollars, for the purpose of ascertaining the cost of the two rival projects and the practicability of placing either one of them "under the control, management, and ownership of the United States." Unfortunately, in this statutory enactment, no provision was made for the investigation of the many and difficult economic and commercial problems upon the proper solution of which depends the vitally important question as to the commercial value of any American interoceanic canal.

The important question as to the military value of an American interoceanic canal has never yet been determined by any thorough and impartial governmental inquiry. Thus far proponents of canal schemes have been able to prevent such inquiry by order of Congress. The governmental reports touching upon this feature of the proposed canals are, on the whole, unfavorable. It is now seen that if the Nicaragua Canal had been completed before the outbreak of the late war with Spain the U. S. battleship *Oregon* would not have passed through it, for the reason that the warships which would have been required for the

defense of its eastern entrance and the troops which would have been required for the defense of the entire line were then needed for other service. The whole question as to the military value of the Nicaragua Canal to the United States in time of war is, however, fatally compromised by the blundering Clayton-Bulwer treaty of 1850. That treaty secures to Great Britain and other foreign nations equal rights for the passage of ships both of commerce and war. Such neutralization of the Nicaragua Canal was clear to Mr Blaine and was stated by him, as Secretary of State, to Mr Lowell, our Minister to England, in a letter dated November 19, 1881. There is no feature of the American interoceanic canal scheme which demands more patient and thorough governmental investigation than does that as to its military aspects.

As the shipping of Great Britain and other nations engaged in international commerce greatly exceeds that of American vessels thus employed, either the Nicaragua Canal or the Panama Canal, if completed, would be much more subservient of foreign than of American shipping interests. This is indicated by the following facts: During the six months ended June 30, 1898, the total tonnage which passed through the Suez Canal amounted to 4,842,078 tons, of which 3,252,634 tons, or 67 per cent, was British; 471,571 tons, or nearly 10 per cent, was German; 439,001 tons, or 9 per cent, was French, and only 1,531 tons, or three one-hundredths of one per cent, was American. Again, during the year ended June 30, 1898, the tonnage entered at ports of the United States from foreign countries amounted to 21,700,311 tons, of which 18,337,836 tons, or 84 per cent, was foreign and only 3,362,475 tons, or 16 per cent, was American. Surely it would be better for the country to adopt an efficient policy for the restoration of the American merchant marine before entering upon the construction of a canal, at least 90 per cent of the benefits of which, if any, would inure to the ships of other nations, under the provisions of the Clayton-Bulwer treaty.

The fact that the proponents of the canal companies who now seek governmental aid have been unable to float their securities in the money markets of the globe constitutes overwhelming presumptive evidence of the unworthiness of their project from the commercial point of view. It is idle to assume that the scheme is too large for private enterprise, when hundreds and

even thousands of millions of dollars are continually being secured for commercial and industrial enterprises of merit.

When M. de Lesseps visited this country in the year 1880 I was invited by the American Society of Civil Engineers in my then official capacity as Chief of the Bureau of Statistics in the Treasury Department to compute the amount of tonnage which would probably pass through an American interoceanic canal. This I did, under an order of the Secretary of the Treasury, investigating the available sources of geographic, economic, and commercial information. The work was one of considerable magnitude. It was begun in the month of February and completed in the month of August, 1880. I reported a possible tonnage of 1,625,000 tons per annum for any one of the proposed canals. Since the year 1880 seven transcontinental lines and parts of lines have been completed, the facilities for transportation by rail have been greatly increased, there has been an enormous development of transcontinental traffic, and, as already shown, rates have greatly fallen. In a word, the general trend of the evolution of transportation facilities during the last twenty years has been in the direction of reducing the possible tonnage of any American interoceanic canal. From a computation based upon all the controlling conditions of the present day, I conclude that not more than 400,000 tons of shipping annually can be confidently expected to pass through any such canal. The receipts of any American interoceanic canal from tolls would therefore be insufficient to meet the expenses of its maintenance and administration, with nothing for interest on cost of construction, amounting probably to eight million dollars a year.

During the last ten years I have from time to time plead for a thorough and impartial investigation of the economic and commercial aspects of the proposed American interoceanic canal project by a commission upon which there should be placed no advocate or opponent of any one of the proposed schemes, and now through THE NATIONAL GEOGRAPHIC MAGAZINE I submit to the criticism and impartial judgment of geographers, economists, and students of commercial problems throughout the world my conception of the nature and scope of a proper governmental inquiry, and the main facts and conditions upon which such inquiry should be based.

THE INTEROCEANIC CANAL*

By Emory R. Johnson,

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The nature and scope of the influences which a canal across the American isthmus will exert have not been so thoroughly studied as have been the engineering and political questions connected with the enterprise. Congress has established several boards of engineers to survey the canal routes and to report upon the technical problems and to estimate the probable cost of the work; but as yet there has been no official report upon the industrial and commercial effects that will follow from the construction of the waterway. It is not altogether obvious what economic changes will be brought about by the canal, and it would seem desirable that we should understand more clearly than we now do why this waterway is essential, if it be so, to the welfare of the American people and the American nation.

The construction of an isthmian canal is proposed for the general purpose of shortening distances between the Atlantic and Pacific. The route for sailing vessels between San Francisco and New Orleans, the route now being by way of Cape Horn, will be shortened 11,000 miles, that from San Francisco to New York 10,000 miles, and to Liverpool 7,200 miles. For steamers the distances saved will be about 2,000 miles less, because they pass through the Straits of Magellan instead of rounding the Horn, and also follow a more direct course than sailers can. The canal will make Valparaiso 1,000 miles nearer to our

*As a writer on the industrial and commercial aspects of the Isthmian Canal problem, known to regard favorably the proposed construction of a waterway across the Republic of Nicaragua, Professor Emory R. Johnson was invited to contribute an article on the subject to this number of The National Geographic Magazine. His engagements being such as entirely to preclude him from accepting the invitation, he has, at the special request of the Editor, kindly revised for this issue the article which he wrote a few months ago for the *Independent*, in which the benefits which he considers likely to accrue to American commerce from the construction of an Isthmian Canal are very clearly and forcibly set forth. If any justification were needed for the virtual reproduction in this Magazine of an article that has recently appeared in so widely-read a journal as the *Independent*, it should be sought in the desire of the Editor to present both sides of that most important question, whether the benefit to be derived by the United States from the construction of an Isthmian Canal would be such as to justify a large Congressional subvention.—Ed.

Atlantic ports than to Europe, and will bring our Atlantic and Gulf cities nearer than Liverpool and other European cities (their route being through the Suez Canal) to Australia, Japan, and China from Shanghai north.

How will these modifications in distances affect our navy, our industries, and our commerce? We have had some recent illustrations of the way in which an isthmian canal would affect the efficiency of our navy. The battleship *Oregon* left San Francisco March 19 and arrived at Jupiter inlet, Florida, May 25, having been 67 days *en route*. If there had been a canal across the isthmus, the *Oregon* could have reached Florida in 15 days. She would have saved 52 days' sailing and made the trip in one-fourth the time. We are now sending two men-of-war from the Atlantic to the Philippines. It takes these vessels about 50 days longer to reach their destination by rounding South America than it would by way of an isthmian canal. With the canal constructed we shall be able to accomplish much more with the war ships in our possession, and will need to construct and maintain fewer ships than will otherwise be necessary. If we do not construct the canal, we shall need to put a third of what the waterway would have cost into additional naval vessels. The expense of maintaining these ships would cover more than one third the cost of operating and maintaining the waterway.

The effects which the canal will have upon our economic interests will be, in general, those which will result from lengthening the radius of the circle within which the industries of our country may exchange commodities. Shorter and cheaper transportation, such as an isthmian canal will afford, stimulates existing industries by giving them more and larger markets and enabling them to secure more advantageously the raw materials which they require. Improved transportation also leads to the establishment of new business enterprises and develops domestic and foreign trade. That the isthmian waterway will affect these general results in the United States may be shown by considering how it will change our relation to the lines of the world's commerce and by noting the way in which the canal will affect the industries in the eastern, southern, central, and western sections of our country.

The leading industrial nations of the world are adjacent to the North Atlantic These countries originate the larger part of the world's commerce; the main streams of international trade

are those which connect these countries with each other and with those regions of the earth less highly developed industrially. Inasmuch as the land masses of the earth lie mainly in the northern hemisphere, and, indeed, very largely north of the Tropic of Cancer, the primary routes of commerce are those which follow the parallels of latitude proceeding from the North Atlantic as a center east and west to reach developing regions in America, Asia, and the Orient generally. The routes of traffic of secondary but increasing importance run with the lines of longitude connecting the lands of the north temperate zone with the tropical regions and the countries which occupy the relatively restricted land areas of the south temperate belt.

The Isthmus of Suez, just north of the Tropic of Cancer, and the Isthmus of Panama, a short distance south of that line, were the only barriers which nature placed across an otherwise continuous water route around the earth in the northern hemisphere. These barriers diverted the lines which the world's largest volume of traffic tends to follow far to the south around Africa and South America, or did so until 1879, when Europe overcame the barrier of most consequence to her by the construction of the Suez Canal. Since the opening of that waterway Europe has enjoyed trade advantages far superior to those enjoyed by our country. Our regions most highly developed industrially are tributary to the Atlantic and Gulf of Mexico. To the east of us lies Europe, a region of great industrial advancement, demanding little more than our surplus food products and raw materials; to the south are the countries of the South Atlantic lying along the line of the world's secondary commercial routes; countries, moreover, whose trade we can secure only in direct competition with Europe, which has already forestalled us at many points. In pushing their trade westward the industrial states of the United States—and they are found in the eastern half of our country—find that the possibilities of a traffic by land are restricted within narrow bounds by the heavy costs of a long haul over the elevated Cordilleran Mountain ranges, while shipments by water have to take the circuitous and expensive route around South America. Until an isthmian canal is constructed the United States will be very seriously handicapped in its competition with Europe for the trade of all countries bordering the Pacific ocean.

Such being the general relation which the canal will bear to the commercial development of the eastern half of the United

States, how will it affect the leading industries of the different sections of the country? The northeastern section is one of varied manufactures and corresponds roughly with western Europe in industrial development. The manufacturers of this part of our country can hardly hope to build up a large trade with Europe, but can unquestionably develop large markets for their wares in the western third of the United States and in the markets of the Orient when the time and expenses of transportation have been reduced by an isthmian waterway. A trade of some importance, though not large, can be established in western South America.

Our southern states are now producing much more cotton than the mills of Europe and our own country can use, and are anxious to increase their sales both of the raw staple and of cotton manufactures in the Pacific countries. Besides developing the cotton textile industry the South is opening up her rich coal and iron mines and manufacturing iron and steel, and these industries must also look to the West for their chief markets.

The states north of the Ohio and Missouri rivers include our richest agricultural resources, our most productive iron mines, our chief stores of bituminous coal, and also have forests of large extent. The industries of these states, though still mainly extractive, are to a large and rapidly growing extent composed of manufactures. Their mills and factories turn out large quantities of iron and steel, machinery, ships, furniture, wooden wares, and flour. That these states in the central part of our large country are enjoying such a phenomenal industrial development is due mainly to the transportation facilities which have been provided by the railroad trunk lines to the Atlantic and the Gulf, the Mississippi and Ohio rivers, the Great Lakes, and the Erie Canal. Whatever cheapens transportation accomplishes surprising economic results in this section of our country. The canal across the American isthmus will give the central West a chance to increase its traffic with the trans-Cordilleran states and with the foreign countries that border the Pacific. What the Great Lakes and the Erie Canal have done for the eastern trade of these states, the interoceanic canal will do for its western trade.

The section of our country tributary to the Pacific is devoted mainly to agriculture, stock-raising, farming, lumbering, and the mining of the precious metals. Most of the products of these industries are bulky, and only the precious metals, fruits, and a

few forest products of high value can bear the costs of transportation by rail over the mountains to the eastern states. The people of the Pacific states are eager to increase their trade with Europe and the eastern half of the United States, and are clamoring for an isthmian canal. The waterway will do for the eastern trade of the Pacific section what it will do for the western trade of the eastern, southern, and central states.

In considering the general commercial and industrial changes which an interoceanic canal will effect, attention may well be directed to three things which the waterway will not accomplish:

First. It is possible that the traffic through the canal will not grow more rapidly than did the commerce through the Suez route. British India, the East Indies, and other countries with which Great Britain and the continental nations trade by way of the Suez Canal had, when the Suez route was opened, more extensive industries and a larger and longer established commerce than have many of the Pacific countries whose commerce is to cross the American isthmus. In the case of the Suez Canal it was largely a question of increasing an existing trade. The American isthmian canal traffic will consist mainly of a newly created trade and only to a small extent of an existing traffic diverted from present routes. The American canal, however, will have the advantage of connecting the two coasts of the United States, and the commerce between these sections will increase rapidly.

In the second place, it must not be expected that the canal will give us control of the Pacific trade unless we accompany the construction of the canal with the establishment of other agencies that give our European competitors greater trade advantages than we now possess. There must be international banking facilities provided; we must have cable connections with the South American and Pacific countries, and, most important of all, we must bring about the establishment of more lines of vessels plying regularly between American and foreign ports. These auxiliaries of commerce, as well as the canal, are essential to commercial expansion.

Thirdly. The canal is not going to be a detriment to the transcontinental railroads. Some people suppose that it will, but the history of the competition of waterways and railroads does not warrant such a conclusion. The railways to the Pacific will find that their traffic will increase more than *pari passu* with the growth of the business done through the canal. Some of the

freight now carried by rail will be diverted, but the amount will be small, and will be more than made good by the increased traffic that will result from the industrial and commercial development produced by the canal. The railroads having the heaviest traffic in the United States are those which serve the territory adjacent to our Great Lakes, upon which there is an enormous freight business done. In Germany the railroads carrying the largest volumes of traffic are in Westphalia, through which flows the Rhine, the busiest waterway on the continent of Europe. The interoceanic canal will not only increase the total volume of business done by the transcontinental railroads, but it will also increase the ratio which the local freight will bear to the total traffic. The canal can only carry its traffic between the seaports; the railroads must collect and distribute the commodities it transports, and that means a larger amount of local freight, the business from which the roads derive their best profits.

The policy of territorial expansion which we have apparently decided to adopt is fraught with many duties and not a few dangers. Some public leaders are opposing the acquisition of colonies, but no one is opposed to the acquisition of trade and the expansion of our commerce. The necessity for promoting our foreign trade is recognized by all parties and sections, and our attention is being directed more and more to securing our full share of the prospectively large trade of the countries of the Pacific. In order to compete successfully with Europe in the Pacific we need the canal across the American isthmus.

PLANS FOR REACHING THE SOUTH POLE

By Gilbert H. Grosvenor

The return of the *Belgica* in early spring, with the splendid record of being the first vessel to pass a winter within the Antarctic circle, and the bold landing of Captain Borchgrevink and his scientific staff on Victoria Land, where they are now making the first attempt ever made by man to winter on Antarctic land, have given great impetus to the projected Antarctic expeditions from England and Germany. Announcement is made that the British government is ready to grant a subsidy of $200,000 for the Antarctic expedition that is to set out in the summer of 1901 under the joint patronage of the Royal Society and of the Royal

Geographical Society, and unless the promoters of the German expedition are being misled in their expectations, the Reichstag will soon guarantee substantial aid to the German National expedition. As one of the main subjects to be dealt with at the approaching International Geographical Congress at Berlin will be the mutual coöperation of these two expeditions, it may not be inopportune to review briefly the plan and route of each.

It was originally intended by the Antarctic Committee, representing the Royal Society and the Royal Geographical Society, that the English expedition should consist of two ships, and that it should be under naval discipline and led by naval officers. In consequence, however, of the unwillingness of the government to consider such a plan with favor, the committee finally determined to equip but one vessel and to make an appeal for funds to the general public. The appeal has met with so generous a response that, including the splendid gift of $125,000 by Colonel Longstaff, $200,000 has been obtained. The plans of the expedition have not yet been finally determined in all their details, but it has been decided that the ship shall follow what is known as the South American route, sailing from the South Shetland islands southward to Alexandria Land. Here, at about 70° south by 90° west, a landing will be made, if practicable, and the first station established. Continuing onward, their course being dependent, as shown in the map (plate 8), upon the amount of ice encountered, the party expect to establish on Cape Adare, Victoria Land, a second station, from which the great dash for the South Pole will be attempted, and in the vicinity of which the principal scientific work will be accomplished.

The movement for a distinctly German expedition to the South Pole may be said to date back to the early seventies, when Dr Neumayer, the originator and organizer of the entire undertaking, began his agitation to that end. But his untiring advocacy of Antarctic research gained no practical recognition until 1895, when the Bremen meeting of the German Geographentage acknowledged its importance. Finally, somewhat over a year ago, plans took such definite shape that Dr Erich von Drygalski, professor at the Imperial University of Berlin, was chosen as the leader of the expedition. Since then the route to be followed has been carefully determined, and nearly all the details for a two years' exploration have been arranged.

The principal danger to navigation in the Antarctic region is not ice pressure, for the currents radiate outward and not in-

ward, but rather the stormy nature of the sea. Captain Drygalski proposes, therefore, to construct his ship on lines that will insure seaworthiness. This he believes can be secured by a vessel stanchly built of wood, with strong internal supports, which will at the same time afford protection against powerful magnetic influences.

The Kerguelen islands, lying in the Indian ocean at 70° east by 50° south and open to navigation at all seasons of the year, are to be the starting point. From these islands the route follows a line southwestward to some point on Wilkes Land, where a winter station will be built upon the edge of the ice-sheet and systematic observations taken. In the early spring an advance will be attempted on sleds across the ice in the direction of the magnetic pole, and in the fall a return will be made in a westerly direction along the little-known coast of Wilkes Land. Perhaps the party will be able to reach the most southerly known land, Victoria Land, discovered by Ross in 1842. As the English explorers are to build a station on the edge of this same Victoria Land and thence proceed southward as well as along Wilkes Land, Victoria Land will be the objective meeting ground of both expeditions. But naturally no geographic limits can be set in a region about which scarcely a single conclusion can be formed.

Captain Drygalski has repeatedly emphasized a condition now prevailing in southern waters which is especially noteworthy in view of the statement of Dr Supan that we are now passing through an unusually warm-temperature period. This condition, as stated by him, is as follows: "The unusual quantity of drift-ice which first appeared in the South Atlantic ocean in 1891 and 1894, and then in the Indian ocean from 1894 to 1897, has each year advanced further toward the east and has now reached the Kerguelen islands, which are for the most part beyond the northern limit of drift-ice. From its nature we are able to determine that it is land-ice which has at last broken away after years of confinement to the mainland, a phenomenon well known as happening at long intervals in the northern parts of Greenland. Similar unusual variations in the conditions of the ice in the Antarctic region have been previously remarked. Though Captain Weddell, in 1823, from the South Orkney islands was able to advance unchecked as far as 74 degrees of latitude, and thence reported a sea free of ice as far as the eye could reach, all subsequent explorers have found an impenetrable barrier in front of them long before reaching that point." Inasmuch as a

less obstructed advance than hitherto will be possible after the disappearance of this remarkable quantity of drift-ice, the next few years will be especially favorable for the resumption of Antarctic exploration.

Apart from purely scientific reasons, an ambition to advance German naval prestige is a prominent motive in the advocacy of a national expedition. The following paragraph, quoted from the *Kölnische Zeitung*, tends to show that the same logic that prompted the purchase of the Caroline and Mariana islands will be the most convincing argument for any vote by the Reichstag in favor of a large subsidy for the expedition: "For naval supremacy are necessary not only men-of-war and a merchant marine, but also an active participation in those scientific undertakings which lead to man's conquest of the sea. Such enterprises we Germans formerly left to others. Then we not only considered strategic points in distant seas unnecessary for ourselves, but actually surrendered to foreign hands, one after another, the approaches to our own harbors. Each course was equally inglorious; but about 1860 a desire arose for a personal share in the exploration of the North Polar regions, and from this feeling has grown the demand for a German fleet and the renewal of the plan for a canal to the North sea and of other similar projects. The honest conviction has come that all these enterprises are mutually dependent and but parts of one whole. To be strong at sea in the knowledge of readiness to fight, to be strong at sea in the consciousness of a peaceful commerce that carries our flag into every port, to be strong because of a scientific and intellectual conquest of the sea, are the rights of a great people working for one end—national development. Therefore let us hope that the German Antarctic expedition will not only add great honor to our scientists, but also bring new glory to German valor at sea."

The advantages, both from a geographic and general scientific point of view, of a further exploration of the South Polar regions have been so repeatedly set forth that it is hardly necessary to enlarge upon them here. Briefly they may be stated as: the verification or disproof of the existence of a vast Antarctic continent; the determination of the origin of the cold ocean currents which have their rise in the south; the study of the nature of ice itself, of the differences between land-ice, sea-ice, river-ice, etc; and the investigation of the conditions of atmospheric pressure and temperature, of volcanic action, and of terrestrial magnetism within the Antarctic circle.

GEOGRAPHIC LITERATURE

The United States, with an Excursion into Mexico. Handbook for Travellers. Edited by Karl Baedeker. Pp. c + 579, with 19 maps and 24 plans. Second revised edition. Leipsic: Karl Baedeker. 1899. Sole agents for the United States: Charles Scribner's Sons, New York. $3.60 net.

To those who are not already familiar with Baedeker's famous guide books no brief review of this, his latest and perhaps his most successful volume, will convey any adequate idea of the prodigious amount of information that has been compressed into it or of the judgment and skill with which the attractions of the country for the traveler are set forth. Opening the volume at random, one is at once struck by the clearness and beauty of the maps and plans which accompany the descriptions of the principal cities, mountains, and other places of interest, even to battlefields and public buildings. The minuteness of the information concerning routes of travel, hotels, restaurants, and theaters creates almost as instantaneous and favorable an impression, while upon closer examination the wealth of information brought together and the remarkable discriminating intelligence displayed in the enumeration of the different objects of interest come as the crowning surprise to those who have no previous knowledge of the thoroughness which is characteristic of a Baedeker guide book. No other publication, great or small, can compare with this little volume as a compendium of information concerning the United States, and, guide book though it is, there is no school library in the country too well equipped to find it a useful acquisition. J. H.

The Races of Europe. By William Z. Ripley, Ph. D., Assistant Professor of Sociology, Massachusetts Institute of Technology, Lecturer on Anthropology at Columbia University. New York: D. Appleton & Company. 1899. $6.

This book is a monument of careful and profound scholarship. There is nothing about it superficial. Whether the reader agrees with or dissents from its arguments and conclusions, he will carry throughout its perusal a sympathetic and never-abating admiration for its honesty of purpose and for the wide learning of its author.

In the preface Professor Ripley states that his aim has been "to coordinate, illustrate, and interpret the vast mass of original material" concerning race or physical relationship which has been accumulated by investigators and observers in all parts of Europe. In the oriental tale the Persian khan imposes upon his librarian the task of reducing to a single volume the many hundred manuscripts of his library, and at the same time of omitting nothing which those many manuscripts contain. A task as immense this author imposes upon himself. Too high tribute cannot be paid to the conscientious faithfulness with which he has performed his task. It is manifest on every page and in every line. The

writings of each authority accessible, and none seem to have escaped a tireless vigilance, have been scrupulously studied, their contents mastered, and their opinions presented without bias or distortion. Collignon, Beddoe, Virchow, La Pouge, even Deniker, can complain of no misrepresentation on these pages.

But the author attempts not merely to condense and put together whatever the collaborators in his chosen field have observed and noted down; he endeavors to present a digest of all that has been achieved in the domain of anthropology and ethnology. From what he considers demonstrated facts he seeks to deduce principles and construct a system. For years anthropologists have enjoyed many advantages; governments have assisted in their researches; tape-lines and calipers have been worn out in experiments; thousands of measurements have been taken; interminable tables of figures have been built up. But how many definite results have been gained by all the toil? How much can be discerned distinct in the bewildering maze? If anything, what? These and similar questions Professor Ripley endeavors to answer.

His subject-matter he treats in twenty-one chapters. Chapter III is strongly written and contains the main proposition, the text and test of all, in the cephalic index. Chapter VI, on The Three European Races, is the application of chapter III and is no less ably and forcibly constructed. The other chapters, except the twenty-first, on Acclimatization, are subsidiary to or extension of chapter III. Introduced at frequent intervals are 85 maps with which the author fortifies or from which he develops many of his deductions. These are generally approximative rather than demonstrative, inasmuch as based on a limited number of data. For example, observations on 800 skulls in the Netherlands, where there are more than 5,000,000 living persons and a vastly greater host of dead, or on 1,200 heads in the British islands, where the population exceeds 40,000,000, may point to probabilities but cannot be accepted as proofs. The 235 "portrait types" are of interest and importance, yet often they seem selected by the deductive rather than the inductive method. Apparently the conception is first formed as to what a national type should be, and then from the pictures of that nationality one is picked out conformable.

Like all the rest of us, Professor Ripley has his pet theories. These theories are never mere preconceptions, but are always based on examination and reflection, and are therefore entitled to respect. A theory he has once adopted he regards as a truth and clings to it firmly. Whatever militates against that truth must be argued away. If obstinately it refuses to vanish, he takes refuge in the comfortable adage. "the exception proves the rule," and passes on. He almost carries us captive in the sweep of his logic and learning. But what do his 650 close-packed pages reveal? Instead of a consensus of authorities, we find constant absence of agreement and contradiction of one another. Nor does this dissonance limit itself to matters of detail; the investigators press along on divergent paths to different goals. The reason of this is not hard to seek. Anthropology is a science of recent, almost contemporaneous, birth. It moves with the uncertain feet of a child beginning to walk. Its disciples are

pushing out upon an unknown sea, for which they have themselves improvised discordant charts. So it becomes them to be humble or, at least, if not humble, tolerant of philology and history. Yet even Professor Ripley, judicial and courteous as he usually is, descends to ejaculations like this, "May the day come when philologists shall have an eye to the common decencies," p. 437, and discants on "the current mouthings about Aryans and pre-Aryans," p. 104, and annihilates an inference of Motley with the assertion, "Nothing could be more erroneous," p. 293, 294. Chapters XIV, XV, and XVI form the least valuable portion of the book. Here sometimes the author's punctilious carefulness seems to fail him. He refers to the Jews in a manner satisfactory to the ardent anti-Semite and chips at Polish history in accommodation of a theory. He hardly appreciates the meaning of the historic term "Osmanli." For no conceivable purpose he even states, "The only name recognized by the Osmanli themselves is that of Turk," p. 415, oblivious of the fact that this name they never use, but consider an insult. Most astounding is his eulogium of the Circassians, "In character the Circassians are preëminent," p. 442.

His style is in general clear, often graphic, sometimes eloquent. The unique ethnical conditions of the Caucasus have never been better portrayed than in these words, "Up against such a mountain system . . . have swept great currents of human life from every quarter of the Eastern hemisphere. They have not blended. There has been continuous isolation, to coin a phrase, ample in supply for all." In a splendid sentence, referring to the tenacious Celts of Brittany, he speaks of that "ethnic struggle, unsuspected by the statesmen who were building a nation on the shifting sands of race." The concluding paragraph of chapter XVIII is specially fine. Such limpid, transparent English is rare in scientific treatises. Doubtless the "remorseless criticism," to which we owe the delightful and chivalric reference in his preface, is in part responsible for this admirable result.

Bound separately from the major volume is a comprehensive Bibliography of the Anthropology and Ethnology of Europe, containing nearly two thousand titles. To remark the exceeding value of this supplement of 160 pages would be superfluous.

EDWIN A. GROSVENOR.

Amherst College.

Through Asia. By Sven Hedin. With nearly Three Hundred Illustrations from Sketches and Photographs by the Author. Two vols. Royal 8vo, vol. 1, pp. i–xviii + 1–649; vol. 2, i–xii + 650–1255 and maps. New York: Harper and Bros., 1899. $10.

As the itinerary of one of the noteworthy explorations of recent years, this sumptuous two volume work is a book of the decade. It was prepared for the press during an interval of rest from exploration; and it is reported that, before his recent redeparture for Thibet, the author presented to some royal dignitary (all of whom he delights to honor) half a dozen copies of the book, printed in as many different languages. The demand attested by this extensive reprinting gives little occasion for surprise; for Sven Hedin—newly graduated under the influence of Europe's famous geographer Baron von Richthofen, and with one interesting Asian

trip already to his credit—conceived and successfully carried out a plan for exploration so strikingly novel and ambitious that his name and fame had spread throughout the thinking world even before his book was put on the press. Whatever his future, Hedin has already earned a place among the great explorers of history; and "Through Asia" is the popular account of exploratory work hardly surpassable in interest. Dr Hedin's journeys began with his departure from Stockholm, October 16, 1893; they practically ended with his arrival at Peking in the middle of February, 1897—for the return by post across Siberia was over trodden paths, and gave no opportunity for new observation. The serious work began with a winter journey over the Pamir—the Roof of the World,—where weeks of wintry weather were spent in tedious mapping at altitudes averaging about that of the highest crests of Rockies and Sierra; thence it extended eastward, attaining especial value in the desert of Gobi (Takla-makan), and on the bleak and cloud swept heights of northern Thibet; the original work ended with the passage through the country of the Tangut robbers (whose heads bear the blood of earlier explorers), near the headwaters of the great Hwang-ho and west of myth-shrouded Koko-nor, the great saline lake of western China. Route-maps were carried forward constantly; most were drawn on the scale of 1:95,000; on the flat deserts the scale was reduced to 1:200,000, and in regions of complex morphology it was increased to 1:50,000. The length of the route covered by the mapping was 6,520 miles, of which 2,020 were previously untrodden by Europeans; and there were over 8,000 miles of incidental travel to and from the field of work. Most of the geographic details are necessarily omitted from the itinerary, though two main and several minor maps elucidate the text satisfactorily; the more technical results, geographic, anthropologic, geologic, phytologic, and meteorologic, are reserved for special publications. Ample illustrative material was collected, photographs in the earlier part of the work, pencil or ink sketches after the photographic outfit was lost in the desert; and an abundance of these, with a few artistic pictures, executed in Sweden under the author's direction, enliven and embellish the itinerary. The first winter's work in the Pamir derives interest from the great altitude at which it was conducted, with the attendant climatic peculiarities. There are five principal passes from the Siberian plains over the northernmost range of this stupendous protuberance of the earthcrust, averaging 13,250 feet in altitude; then comes Alaï valley, a singular trough 75 miles long and from 8,200 to 10,500 feet (*i. e.*, from a mile and a half to two miles) in altitude; next begins the Pamir proper in the Trans-Alaï mountains, culminating in Kaufmann peak, 23,000 feet high. Thence southward toward the Himalayan front stretches a plateau, corrugated in east-west ranges and divided by a labyrinth of valleys among which gather the waters of several of the great rivers of the earth, flowing northward to the Arctic, southward to the Indian ocean, and westward to inland seas. The air is wrung dry in ascending the mighty slopes, so that the summer rainfall is limited and the winter snowfall meager; but the light atmosphere is capricious and unstable, so that storms, sudden and severe, lurk always about the passes and harass the valleys. The more tolerable part of the

region is sparsely inhabited by patriarchal and often migratory Kirghiz tribes of pastoral habit; travel is possible for horses and for camels, but the higher districts and snowier stretches repel all burden-beasts save the mountain-born yak, whose peculiar capacities made possible some valuable work. Save for a single earlier Asian journey, the Pamir survey was the author's apprenticeship in exploration, and this part of his itinerary is rich in detail and plentifully seasoned with adjectives; yet it is a surprise, in view of the altitude and latitude (no less than the adjectives), to find the "inconceivable" cold of Hedin's lowest thermometric record —36.8° Fahrenheit, and the "incredible" depth of soil-frost three and a half feet—in many ways a striking contrast to the congealed mercury and six feet of soil-frost in the upper Mississippi valley last winter. Dr Hedin's most minute surveys were those of glacier-clothed Mustaghata (Father of the Ice Mountains), "the loftiest mountain of the Pamirs, and one of the loftiest mountains in the world, [which] towers up to the height of 25,600 feet, and like a mighty bastion overlooks the barren wastes of central Asia" (p. 217). More than once did he circumscribe it; dwelling long on its flanks and about its base at the height of world-famed mountains, he learned the legends to which its majesty has given birth in the simple minds of the natives, surveyed its glaciers, and studied their behavior at different seasons, and strove repeatedly but vainly to reach the culminating dome. The slopes are not inaccessible, but a barrier—half deified by the Kirghiz as the Soroche of the Andes is deified by the Peruvians—exists in the rarity and chill of the air; horses lose their powers little above the plateau level, and men yield to the strain of climbing ere half way up the slopes; the big-lunged and phlegmatic yak might indeed be forced within climbing distance of the crest, but Hedin found that he and his Kirghiz were incapacitated by camping at the 20,000-foot level. So the icy crest, standing guard over bleak Pamir and sun-parched Takla-makan, and looking down on all but the lightest of clouds, remains unhonored by human tread. Of no less geographic interest were the more general surveys in the desert of Gobi (Takla-makan) and the studies of long-mysterious Lob-nor—the shifting lake in which the waters gathering from the eastern Pamir and northern Thibet are lost through evaporation and absorption. The desert work involved several trips, including an ill-starred (and ill-started) journey in which two men, half a dozen camels and some other livestock, as well as much of the instrumental outfit, were sacrificed, the author and his Asian mentor, Islam Bai, escaping with their lives through a succession of accidents with which ordinary foresight had little to do. Partly because of its stress, even this desert experience is a contribution to knowledge; probably no better record of the effects of hunger and thirst on men and animals has been written—though the trip was made with a thermometric range from about 90° downward (*i. e.*, at a temperature considerably lower than that of the blood), so that the march of physiologic events by no means kept pace with that observed in our own Death valley and Mojave desert and Papagueria, where the midday thermometer reaches 130° in the shade and 160° in the sun, or far above normal blood-heat. The later desert trips were productive

in other ways; at least two sand-buried cities of considerable antiquity were brought to light; the camel was found wild, under such conditions as to suggest to the author a domesticated ancestry; and the shiftings of Lob-nor, which, with so slender observational basis, have given rise to so voluminous literary discussion in the last lustrum, were analyzed with no little acumen. One of the most fruitful trips was the final journey eastward from Khotan through northern Thibet to Tsaidam desert and the Koko-nor; a full half of the route traversing a desolate plateau, uninhabitable by reason of aerial rarity and consequent sterility. The plateau, fronted on the north by the Kuen-lun mountains, is corrugated in east-west ridges like the Pamir; but they rise so far above the zone of vapor-weighted clouds that the precipitation is insufficient to produce waterways opening to the sea, and the intervening valleys are lined with wind-blown as well as water-borne detritus and dotted with saline lakes, while the slopes are mantled with frost-fractured debris well toward the crests. Here the classic khulan (wild ass) and the wild yak live, enjoying a seclusion so perfect that the passing caravans awaken curiosity rather than fear. The plains over which they skurry, and even the lakes whose shores they haunt, are amid the higher clouds, 15,000 to 18,000 feet above tide; the low pass in the second range (Arka-tagh) stands 18,180 feet; and even in midsummer the mountain chill is below freezing, always by night and often by day. The trip was not made without effort; all suffered from mountain sickness, Islam Bai narrowly surviving, while the Chinese interpreter was sent back; and of the six camels, twenty-one horses, and twenty-nine donkeys of which the caravan consisted at the outset, but three camels, three horses, and one donkey crawled feebly down to the settlements on the borders of Tsaidam. Yet the observations, geographic and geologic, with studies of yak and khulan and smaller life, well repaid the cost. As the party pushed eastward through Tsaidam, the to-be-expected brush with Tangut robbers—who slew Dutreuil de Rhins and assailed Przhevalsky and Roborovsky—was realized; yet by some chance (or trick of Tangut superstition) the explorers, with three rifles, five revolvers, and two marksmen (not including the leader) escaped actual assault. The exploration was conducted under patronage of King Oscar of Sweden, the Nobel family, and other donors of the $8,000 or $10,000 expended; the support finding its warrant in the admirable outline of past and prospective Asian exploration incorporated in the introductory chapters, and finding justification in the important results attained by Dr Hedin. The narrative is naive, and reveals the personality of the author in attractive fashion. By the vigorous and self-reliant explorers and surveyors who have pushed geographic knowledge over the North American continent, this quiet, spectacled student, chronically homesick and frequently helpless, would be voted a tenderfoot; yet the fact remains that good chance and persistence carried him through stress of weather, hunger and thirst, tricky theft and threatened robbery, with all other explorers' ills, and enabled him to consummate a memorable task in making known the previously unknown world. W J M.

MISCELLANEA

Dr Sven Hedin is on his way to Central Asia for a two and a half years' further exploration of that region.

The heaviest rainfall in the world, sometimes over 180 inches in a single month, occurs at Cherapungee, in India, on a hillside about 4,000 feet above sea-level.

The address of Mr F. H. Newell, Chief Hydrographer of the U. S. Geological Survey, before the Trans-Mississippi Commercial Congress at Wichita, Kansas, is published in the June number of *Irrigation Age*.

"What Glaciers Have Done for Iowa," the subject of an article by Prof. Samuel Calvin in the July number of *Annals of Iowa* (Des Moines, Iowa), demonstrates that glaciers and glacial action have contributed in a very large degree to the making of that magnificent state.

The scientific staff dispatched by the government of France, in charge of Captain Maurain, of the Engineers, and Captain Lacombe, of the Artillery, for the remeasurement of the Arc of Peru and its extension, so as to include five to six degrees of latitude, reached Quito in July.

The "shrinkage" in the distance between Point Viento and Ponce, Puerto Rico, previously given on Spanish charts as 50 miles, but on remeasurement by the U. S. Coast and Geodetic Survey the past winter found to be only 43 miles, is a convincing proof of the necessity of a careful resurvey of the new possessions of the United States.

The *Monthly Weather Review* for May contained an exhaustive article on the "Climatology of the Isthmus of Panama," by H. T. Abbot, Brigadier General, U. S. A. (retired), with a valuable appendix by Prof. A. J. Henry, containing data of the precipitation at different points on the isthmus. Mr A. P. Davis contributes a paper on "Rainfall and Temperature in Nicaragua."

Precisely at 4 p. m. on the 10th day of every month in the year except December, the Bureau of Statistics of the Department of Agriculture is directly connected by wire with every large stock and produce exchange in the country, and a summary of the monthly crop report is simultaneously flashed to every commercial center.

It is a pleasure to announce that the systematic effort begun in June by the National Geographic Society toward the enlargement of its work by increasing its membership throughout the country is proving most successful. Within the last 60 days considerably over 250 non-resident members have been enrolled, representing every state of the Union and different sections of Canada and North America.

Petermann's Mittheilungen states that in the autumn a party under the leadership of A. Paulsen, the Director of the Danish Meteorological Institute, will set out for Iceland, where, from a station to be established on the north coast, they intend to study the magnetic properties, height,

etc., of the northern lights. Similar researches will be conducted by the Swede-Russian expedition in Spitzbergen and northern Norway.

THE *Diana*, under the command of Mr H. L. Bridgeman, of the *Standard Union* and Secretary of the Peary Arctic Club, sailed from Sidney July 20 on the second of the series of annual reënforcements for Lieutenant Peary. As announced in the July number of THE NATIONAL GEOGRAPHIC MAGAZINE, the vessel carries stores of provisions for her own party, for Peary's, and for the *Windward's*, enough for 50 men for one year.

IN an article on the Erie and Welland Canals, Bradstreet's of July 15 says that the phenomenal lowering of railway transportation rates in recent years has tended toward the crippling of all but the most favorably situated of the interior water routes, and adds that it is questionable whether the purely artificial waterways can be so improved as to get back a fair share of the immense traffic which formerly sought these channels on the way to market.

DR F. A. Cook, the surgeon and anthropologist of the *Belgica*, in a paper appearing in the *New York Herald* (July 2, 1899), gives the following summary of the results of the Belgian expedition: "The discovery of a new strait nearly as large as the Straits of Magellan; the discovery of about five hundred miles of new coast; the discovery of a submarine plateau west of Graham Land; a complete series of meteorological and magnetic observations throughout one year." The strait, to be called Belgica strait, is said to begin about five hundred miles southwest of Cape Horn, on the sixty-fourth degree of south latitude, and between the sixty-first and sixty-second degrees of west longitude. Its general direction is southwesterly, with an average width of twenty-five miles and a length of two hundred miles.

PROCEEDINGS OF THE NATIONAL GEOGRAPHIC SOCIETY, SESSION 1898–'99

Special Meeting, February 3, 1899.—President Bell in the chair. Prof. Alfred P. Dennis gave an illustrated lecture on Life on a Yukon Trail.

Regular Meeting, February 10, 1899.—President Bell in the chair. Major A. Falkner von Sonnenberg, of the German Imperial Army, gave an illustrated lecture on Manila and the Philippines.

Special Meeting, February 17, 1899.—President Bell in the chair. Prof. John L. Ewell, of Howard University, gave an illustrated lecture on Germany in the Reformation Period, with its Geographic Relations.

Lenten Course, February 21, 1899.—President Bell in the chair. Hon. David J. Hill, Assistant Secretary of State, gave an illustrated lecture on The Original Thirteen States.

Regular Meeting, February 24, 1899.—President Bell in the chair. Prof. H. S. Pritchett, Superintendent of the U. S. Coast and Geodetic Survey, gave an illustrated lecture on The Results of Recent Alaskan Surveys.

Lenten Course, February 27, 1899.—President Bell in the chair. Prof. Albert Bushnell Hart, of Harvard University, gave an illustrated lecture on The Louisiana Purchase.

Special Meeting, March 3, 1899.—President Bell in the chair. Capt. Edwin F. Glenn, U. S. A., gave an illustrated lecture on his Experiences on a Military Exploring Expedition into Alaska.

Lenten Course, March 8, 1899.—President Bell in the chair. Prof. John Bach McMaster, of the University of Pennsylvania, gave an illustrated lecture on Texas and the Mexican Accessions.

Regular Meeting, March 10, 1899.—President Bell in the chair. Messrs Robert T. Hill and H. M. Wilson gave an illustrated lecture on A Recent Trip to Puerto Rico.

Lenten Course, March 14, 1899.—President Bell in the chair. Mr J. Stanley-Brown gave an illustrated lecture on The Alaskan Purchase.

Special Meeting, March 17, 1899.—President Bell in the chair. Mr Snowden Ward, of England, gave an illustrated lecture on The Land of Dickens.

Lenten Course, March 21, 1899.—President Bell in the chair. Mr Edwin Morgan gave an illustrated lecture on The Annexation of Hawaii.

Annual Reception, March 22, 1899.—The Annual Reception of the Society was held at the Arlington Hotel, from 8 to 10 o'clock p. m. Prof. Willis L. Moore, Chief of the Weather Bureau, explained the workings of meteorological instruments, and Prof. Charles E. Tripler, of New York, gave a demonstration of the properties of liquid air.

Regular Meeting, March 24, 1899.—Vice-President W J McGee in the chair. Mr Henry Gannett, Geographer of the U. S. Geological Survey, gave an illustrated lecture on Redwood.

Lenten Course, March 28, 1899.—Mr F. H. Newell in the chair. Prof. W J McGee gave an illustrated lecture on The Effect of National Growth on National Character.

Special Meeting, March 31, 1899.—President Bell in the chair. Commander Harrie Webster, U. S. N., gave an illustrated lecture on China, the Flowery Kingdom; the Country and its People.

Regular Meeting, April 7, 1899.—Vice-President W J McGee in the chair. Mr F. H. Newell, Chief Hydrographer of the U. S. Geological Survey, gave an illustrated lecture on The Annexation of the West.

Special Meeting, April 14, 1899.—President Bell in the chair. Hon. F. H. Wines gave an illustrated lecture on How the Census is Taken.

Regular Meeting, April 21, 1899.—President Bell in the chair. Dr Mitchel Carroll, of Johns Hopkins University, gave an illustrated lecture on The Acropolis of Athens.

Special Meeting, April 28, 1899.—Vice-President W J McGee in the chair. Dr Alexander Graham Bell, President of the Society, gave an illustrated lecture on Japan, under the auspices of the affiliated scientific societies of Washington.

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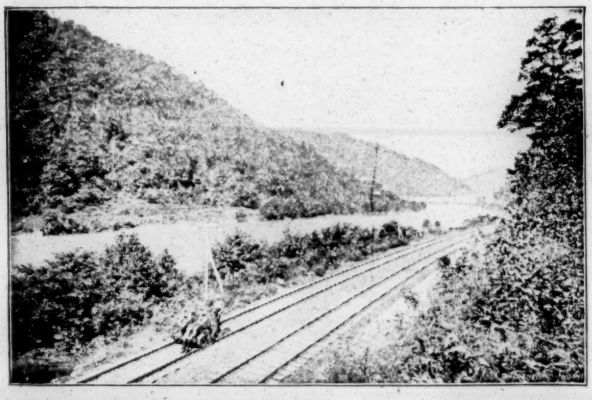

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